Chemical Engineering

MARCH
1955



'55 TECHNOLOGY...

. . . ECONOMICS FOSTERS AUTOMATIC CONTROL

. . . NUCLEONICS NEEDLES UNIT OPERATIONS

. . . NEW TOOLS ACCELERATE DEVELOPMENTS

. . . NEW HORIZONS FORCE DIVERSIFICATION

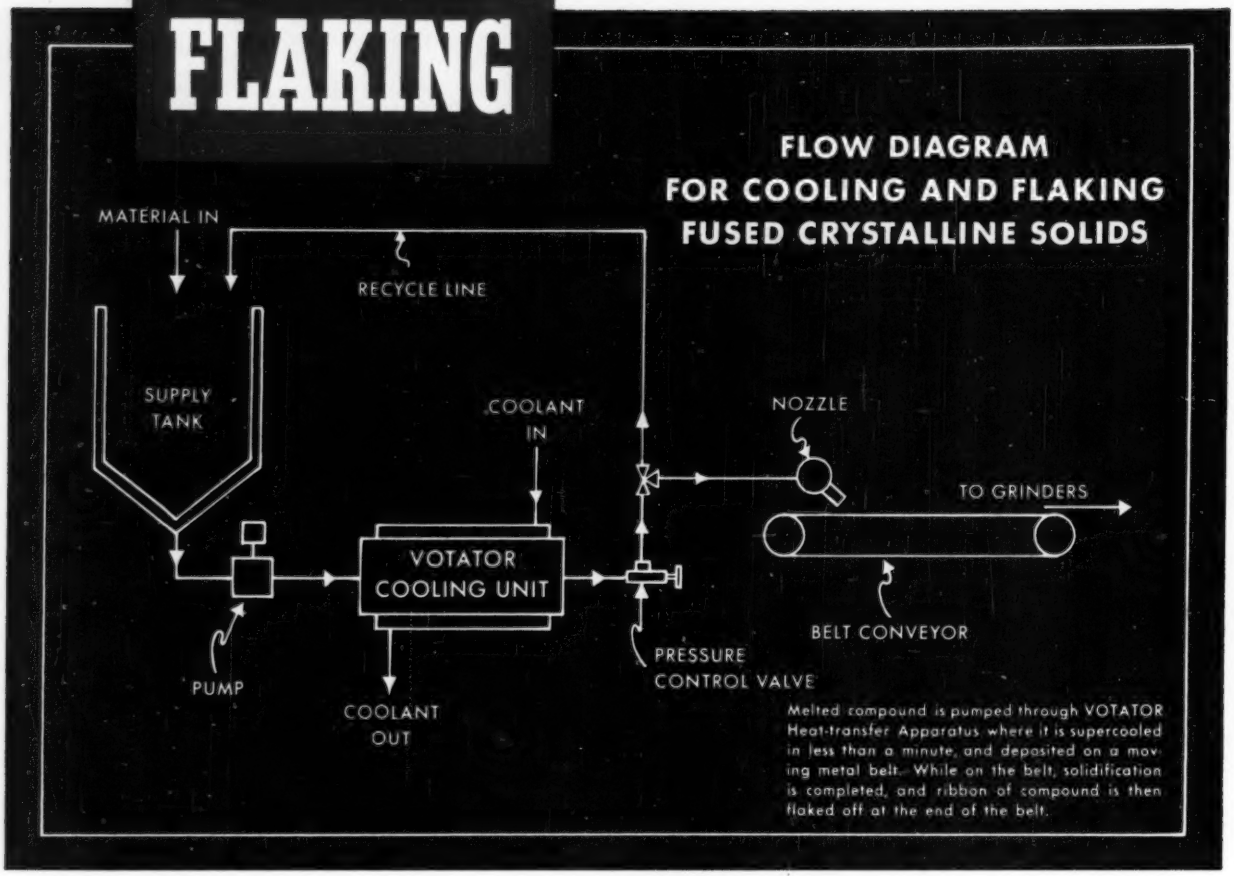
. . . TODAY'S TECHNOLOGY IS AFFECTING YOU

annual review and forecast: page 157

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Cooling	Nitration	Paper Coating
Controlling Heat of Reaction	Crystallization	Paraffin Wax
	Polymerization	Synthetic Wax
Emulsification	Textile Size	Resins
Sulfonation	Shaving Cream	And other Products

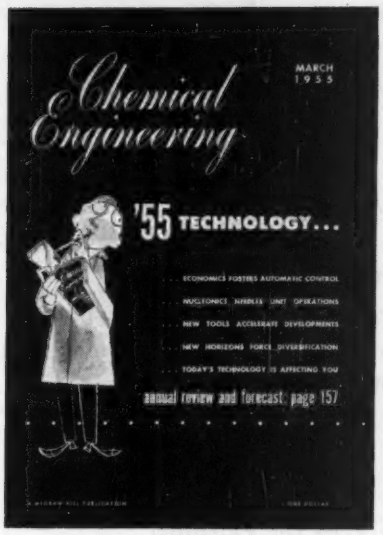
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GUIDED TOUR

JOHN R. CALLAHAM, EDITOR



For the 32nd Time

This year, for the 32nd time, we're publishing our annual "review-and-forecast" report. You'll find it in this issue as Setting the Pace.

Times have changed a lot since we started the series in 1924. So have our reports. This year, for instance, you'll see two major changes:

- Technology has been given the lion's share of attention as an 8-page roundup of major developments and trends in theory, equipment, processes, unit operations, engineering economics.
- Industry-commodity surveys, a part of our annual reviews for years, have been dropped from the report itself. Instead, these will appear in our regular Economics department throughout the year. This makes them more timely and more useful.

We're sure you'll like these two changes: more emphasis on technology in our annual reviews, industry-commodity roundups every month in Chemical Economics.—JRC

. . . Technical progress sets a fast pace this year and for years ahead.

That's why we take a hard look at technological trends in this annual roundup of what's happening in unit operations, processes, equipment. Here you'll find an interpretative rundown on automation, materials handling, radiation chemistry, high temperatures, ion exchange and many other expanding technical frontiers as well as trends in capital expenditures, national legislation, supply and demand. (p. 158)

New heat transfer curves save time.

You can use these new performance curves instead of trial-and-error to find heating surfaces, to predict the effect of fouling on efficiency, to determine amount of fouling at any time. (p. 187)

13 ways to solve packing problems.

If abrasive liquids chew away your pump shafts and packing, here're 13 practical tips to help you. They're from an

Please turn page

GUIDED TOUR

engineer who's spent years specializing in process pumps and their troubles. (p. 183)

New look at price-volume ratio.

Can you predict how the price of a chemical will affect its production rate—and vice versa? An engineer digs deep into the data, develops a new correlation to help engineers and management. (p. 180)

What cost for rubber-lined vessels?

Here are curves to help you estimate costs of rubber-lined tanks and pressure vessels. Data are based on 51 vessels bought by Dow over 8 years. Another in CE's "equipment costs" series (p. 191)

Really want to be an engineer?

In a rut? Lost sight of your goals? Down in the mouth because more opportunities don't come your way? Then it's time to read this refreshing bit of advice from veteran engineer Don Keyes. (p. 212)

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Chemical Engineering

MARCH 1955

CHEMENTATOR 101

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Member A.B.P. Member A.B.C.

To keep pace with the chemical, petrochemical and chemical process industries, more engineers subscribe to Chemical Engineering than to any other publication. Total net paid circulation of this issue:

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HOW TO BE A FILTRATION EXPERT

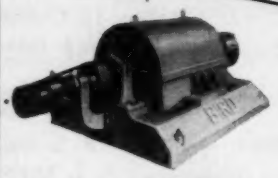
In Two Easy Lessons

First, find the foremost source of filtration equipment — the company that engineers and builds more different kinds of filters than anyone else.

Second, ask that company to recommend the one best filter for the job and to back that recommendation with actual pilot-scale test data obtained from the world's finest laboratory devoted exclusively to solids-liquids separation research and testing.

Bird builds the comprehensive range of filters pictured.

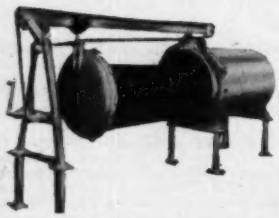
Bird operates the Bird Research and Development Center, a complete building by itself, designed, staffed and equipped expressly for the purpose of providing the actual facts and figures on filtration as they apply to each specific job.



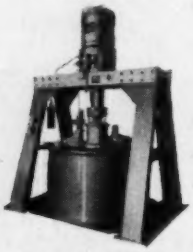
Bird Continuous Centrifugal Solid Bowl Filters



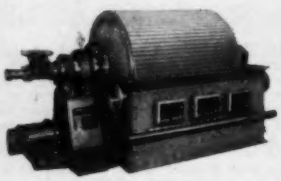
Bird Continuous Centrifugal Screen Filter



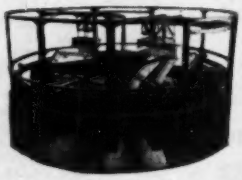
Bird Pressure Filters



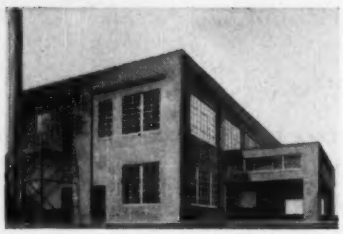
Bird Suspended Centrifugals



Bird-Young Continuous Vacuum Filters

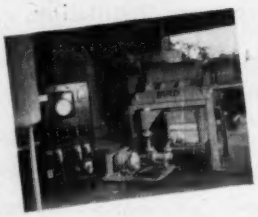


AND NOW, the new *Bird-Prayon Continuous Rotary, Vacuum, Horizontal Filter*









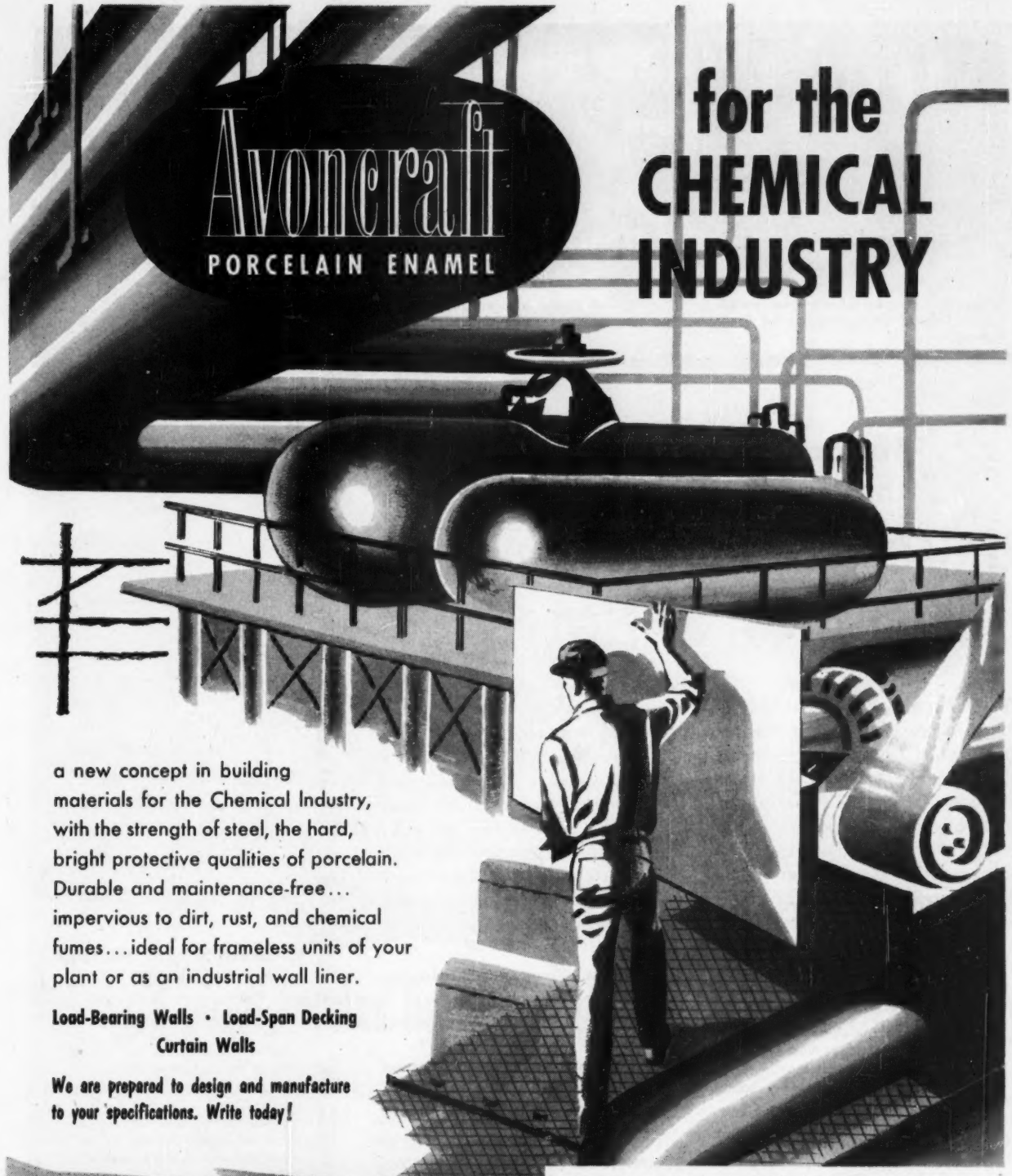


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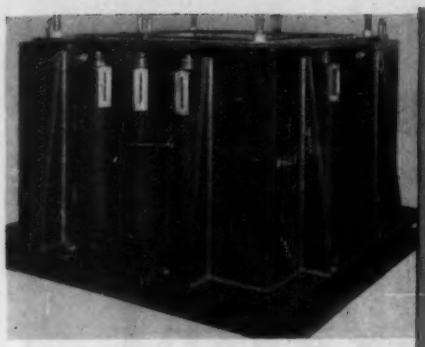
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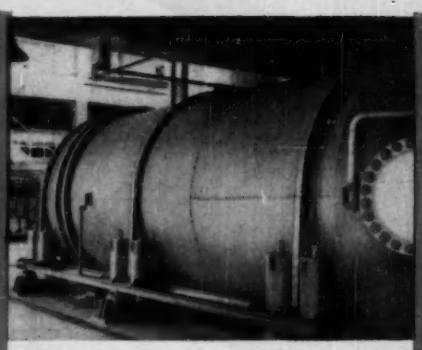
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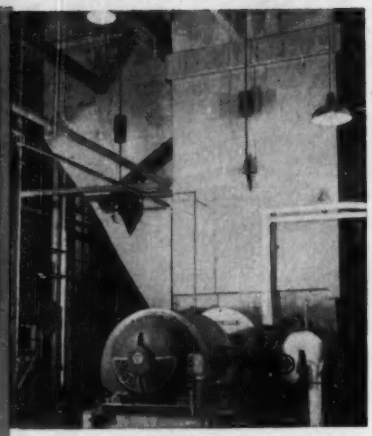
City _____ State _____



Base for supporting refinery tower, provided with Grinnell Spring Hangers for flexible support.



Grinnell Spring Hangers on large vessel of catalytic cracking unit in oil refinery.



Induced draft duct and blower in power station. Operates at about 500°F. Supported by Grinnell Spring Hangers.

To support loads that won't stand still . . .

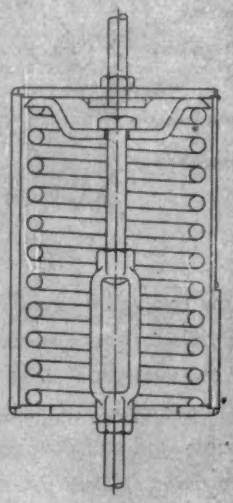
GRINNELL PRE-ENGINEERED SPRING HANGERS

There are many industrial installations where heavy loads must be firmly, but flexibly, supported to keep them under control. Thermal expansion and contraction, of course, can move ponderous objects many inches. Shock and vibration, too, can make rigid support of heavy loads hazardous, due to possible serious trouble at terminals.

For installations such as these, more and more engineers are turning to *flexible* supports by Grinnell. Grinnell Variable Spring Hangers are *pre-engineered* to minimize changes in supporting force over total range of movement. Here are the important features that let these units turn in a star performance in a supporting role:

- Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes.
- Precompression* assures operation of spring within its proper working range, as well as saving valuable erection time. Reduced over-all height saves space.
- Solid steel casing protects spring from damage and weather. Guides assure continuous alignment and concentric loading of spring.
- 18 sizes available from stock — load ranges from 53 lbs. to 12,000 lbs.
- Easy selection of proper sizes from simple capacity table.
- Installation is simplified by integral load scale and travel indicators.

*Precompression is a patented feature.



VARIABLE SPRING HANGER FIG. B-268

Fig. B-268, Type A, is designed for attachment to its supporting member by screwing a rod into a bushing in the top cap of the hanger. Adjustment of the hanger load is accomplished by turning the turnbuckle on the lower hanger rod until the hanger picks up the load and the load indicator points to the desired position. Six other types of attachment are available.

Grinnell Variable Spring Hangers are also available in half sizes (Fig. B-82); and in double spring sizes (Fig. B-98).

GRINNELL

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This marvelous record of trouble-free operation is due to the outstanding corrosion resistance of Geon rigid vinyl from which all parts of the feeder, except the motor, are made. Similar feeders made from other materials frequently broke down in service causing production delays and creating hazards to operating personnel.

This success story of Geon rigid vinyl is one of many in which this unique material is setting new records in industry for handling corrosive materials. Furthermore, Geon rigid vinyl is tough, strong and has excellent electrical properties.

This all rigid vinyl feeder may give you an idea for an equally successful application. There are scores of uses for Geon vinyl materials—from rigid sheets and panels to flexible upholstery, wire insulation, vinyl sponge and many more. Helpful technical information is yours for the asking. Please write Dept. BB-3, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ont.



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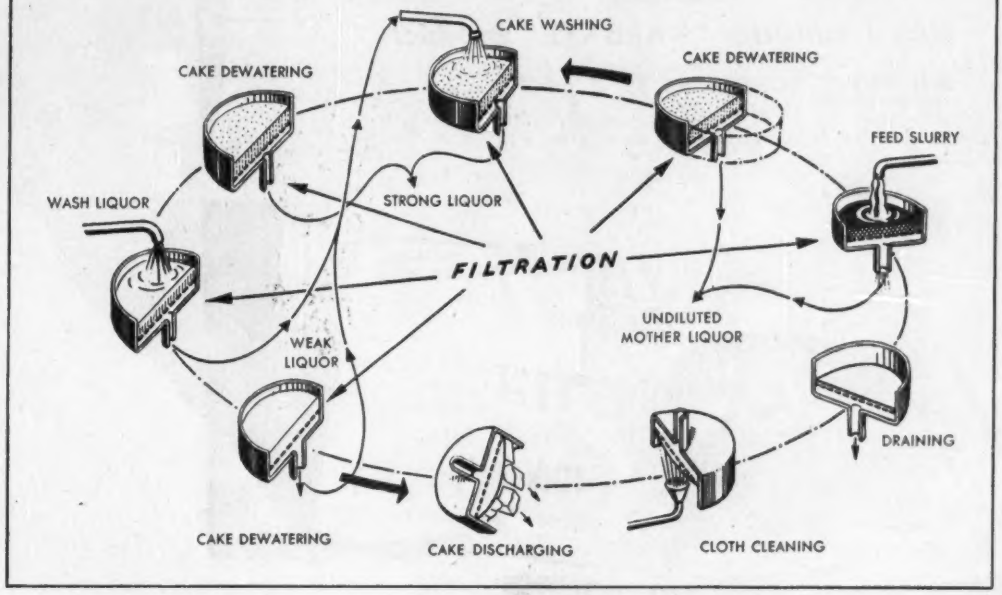
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Remember **FLOWLINE®** WELDING FITTINGS

Forget CORROSION PIPING PROBLEMS



This sketch shows you why no other filter can touch the

BIRD-PRAYON CONTINUOUS ROTARY HORIZONTAL VACUUM FILTER

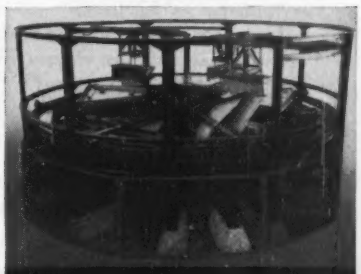
when it comes to washing efficiency

- look at the automatic filtration cycle and see for yourself
- as many as *five* stages of countercurrent wash are permitted
- wash liquors are kept completely separate from the mother liquor and from each other — solubles in the cake get down to an irreducible minimum, using as little as half the wash water required on other types of filters.

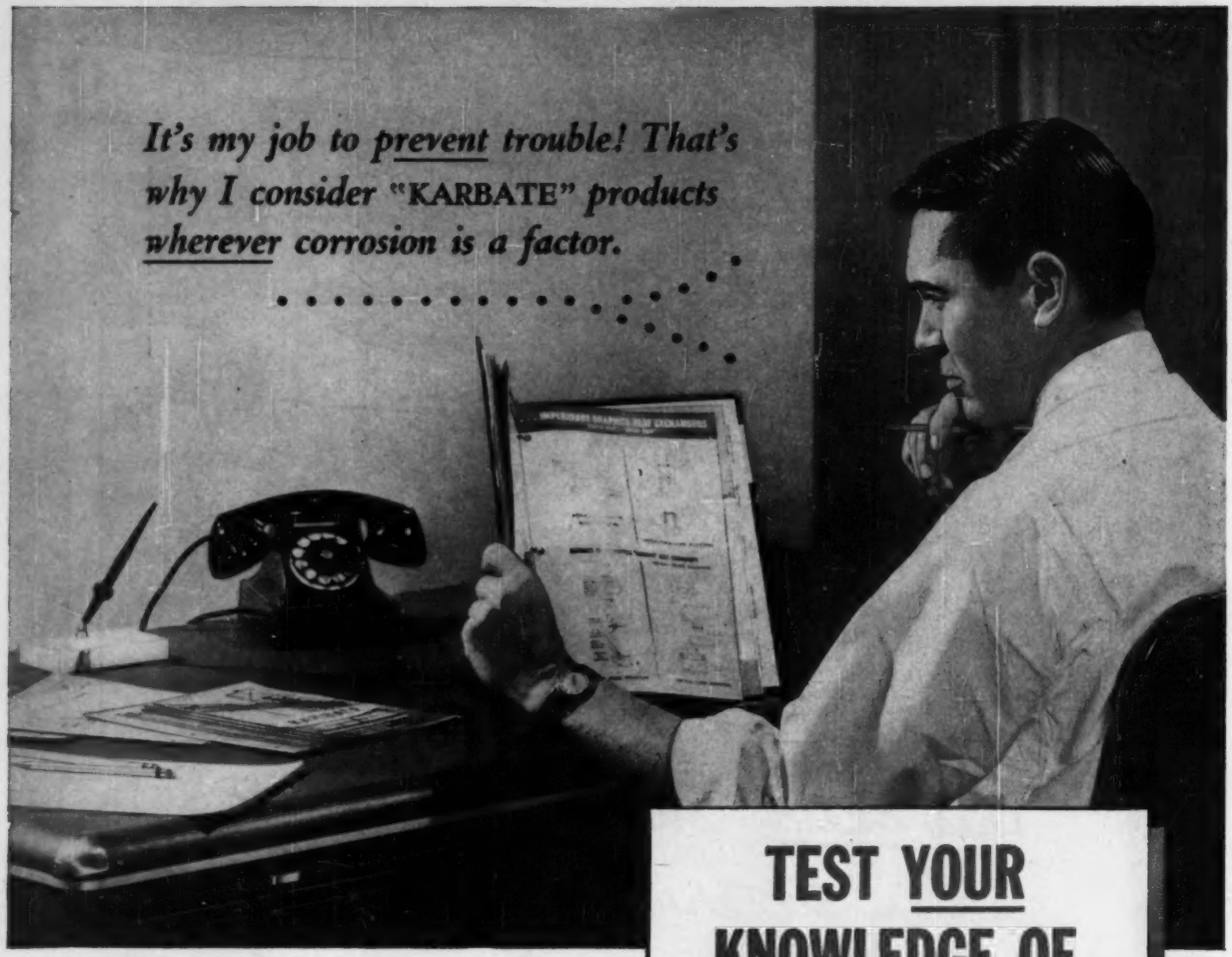
The Bird-Prayon Filter offers other outstanding advantages:

- filter cloths last a long time; they do not blind; as you can see from the sketch of the cycle the cloth is completely fresh and clean each time it takes the feed
- the entire operation is trouble-free and low cost
- the Bird-Prayon Filter comes in six sizes, providing from 27 to 516 sq. ft. of filter area
- *pilot scale test data is readily obtainable*

Write for new Bulletin containing a complete description of this extraordinarily useful and efficient Filter.



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Pumps—Catalog Section S-7250

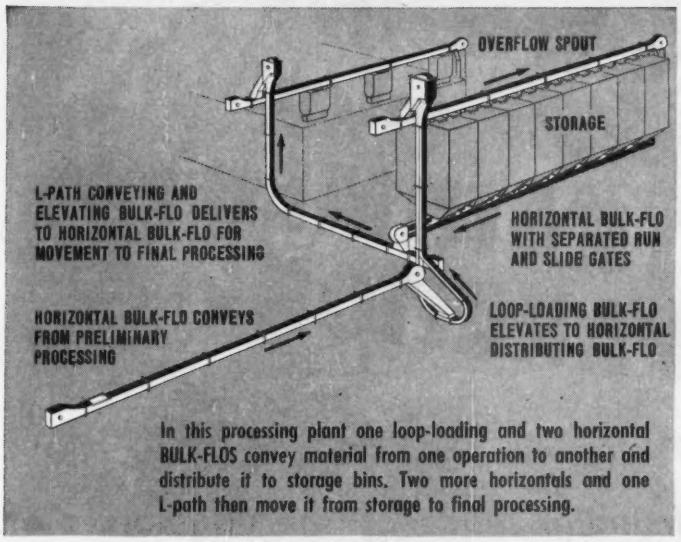

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Heat Exchangers—Catalog Sections S-6740 and S-6840

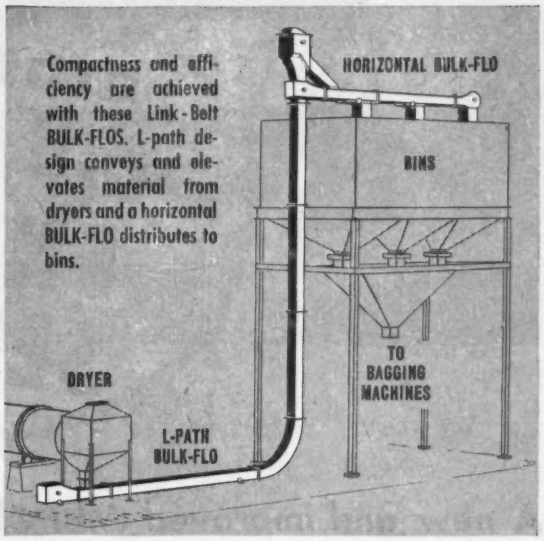

Cascade Coolers—Catalog Section S-6820

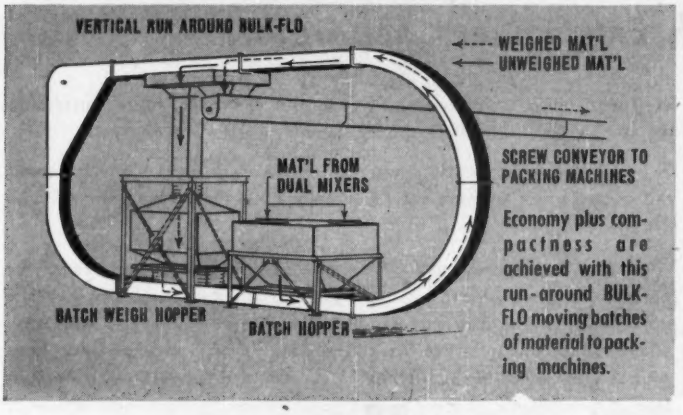

HCl Absorbers—Catalog Section S-7460

Here's how BULK-FLO units can feed-convey-elevate your materials

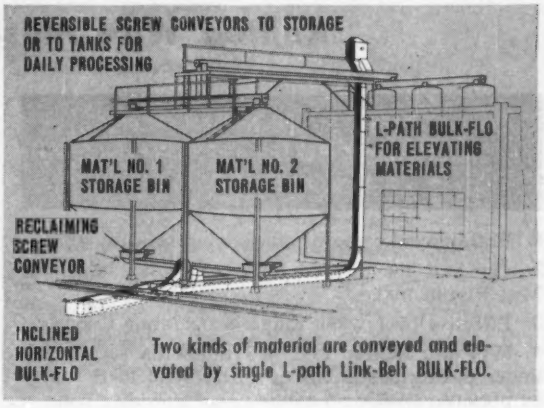


In this processing plant one loop-loading and two horizontal BULK-FLOS convey material from one operation to another and distribute it to storage bins. Two more horizontals and one L-path then move it from storage to final processing.





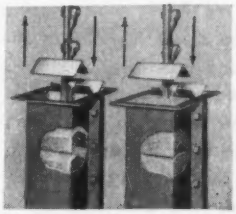
Economy plus compactness are achieved with this run-around BULK-FLO moving batches of material to packing machines.



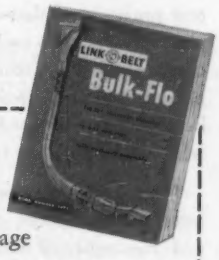
Two kinds of material are conveyed and elevated by single L-path Link-Belt BULK-FLO.

Single, compact, enclosed assembly . . . operates fully or partially loaded

SHOWN above are four of many handling variations possible with Link-Belt BULK-FLO. This single assembly moves materials along horizontal, vertical and inclined paths . . . combines feeding, conveying, elevating. Flexible, compact and sanitary—BULK-FLO often replaces several handling units—in less space . . . at lower cost. Get complete information from your nearby Link-Belt office or send coupon for your copy of Book 2475 today.



FULL OR PARTIALLY LOADED—Link-Belt BULK-FLO assures positive, gentle movement of material. Self-clearing through intermediate runs, it prevents contamination.



LINK-BELT

BULK-FLO FEEDERS • CONVEYORS • ELEVATORS

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Chicago 1, Ill.
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Please send me a copy of your 28-page BULK-FLO Book 2475.

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LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,678

now!

more effective and economical ENTRAINMENT SEPARATION...

A new and improved Mist Eliminator made by the originators of Knitted Wire Mesh Entrainment Separators

CHECK THESE 5 IMPORTANT POINTS — THEY MEAN BETTER PERFORMANCE AT LOWER COST!

1. Entrainment removal efficiency practically 100%.
2. One-half the pressure drop of present Standard Mist Eliminators.
3. Effective over wider range in operating velocities.
4. Will also deliver 2-½ - 3 times the service life under coking conditions or where solid matter may be present.
5. A better Mist Eliminator at a lower price because wires are re-positioned by our patented* Herringbone Fold.

*U.S. Patent 2,565,846, August 28, 1951

In a nutshell this tells the story of the new METEX Hi-Thruput Mist Eliminator. After long research and testing, with results checked and confirmed by an outstanding firm of consulting engineers*, it is now offered to the refining and processing industries. Though originally developed to prolong service life under coking conditions in high temperature petroleum processing, tests and experience have proved the new Hi-Thruput Herringboned Mist Eliminator to be a better performer than the present Standard Separator *where liquids only are involved.*

Three basic improvements, resulting from this Herringbone Fold are shown in photographs 1 and 2 — Standard and Herringboned Mist Eliminators (opposite page). "Herringboning" results in:

1 Making maximum wire surface area free and usable for impingement of liquid droplets. No longer is an appreciable portion of wire area "blocked out of service" by being compressed against other wires in the same layer.

2. Repositioning of all wires within the Mist Eliminator, further increasing the number and diversified location of these impingement targets.

3. These two essential improvements are achieved without any increased restriction. In fact, pressure drop is cut to one half that of the present Standard Mist Eliminator.

A *fourth improvement* results from modifying the size and contour of the openings in the knitted mesh (see figures 3 and 4 opposite page). While it might be natural to assume that larger openings in the knitted wire mesh might reduce the effectiveness of the unit, tests and experience have proven the reverse to be true. In fact, with the new METEX Hi-Thruput Mist Eliminator you can confidently look forward to maximum efficiency over a wider range of applications and operating conditions.

This new Hi-Thruput Mist Eliminator is slightly thicker, about 5½ to 6 inches compared to the Standard 4" thick unit. This is due to an increase in free volume and not to the use of more wire. In fact, the new METEX Hi-Thruput Mist Eliminator can be made with less weight of wire per square foot (since all wire area is exposed and usable) and therefore costs less than a Standard unit of the same area.

Write today for your copy of Metex Bulletin ME-5 which describes this new Hi-Thruput Mist Eliminator in detail. It will pay you to get the facts about this latest improvement in entrainment separators.

*Foster D. Snell, Inc., New York, N. Y.

METAL TEXTILE CORPORATION

Knitters of Wire Mesh for More than a Quarter Century

Roselle, New Jersey

...with the new METEX Hi-Thruput Herringboned Mist Eliminator!

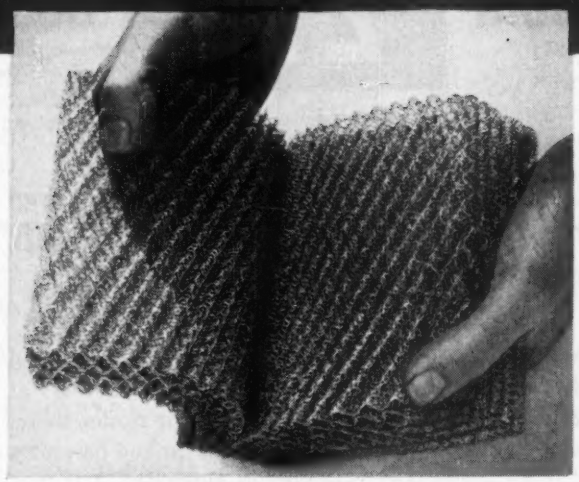
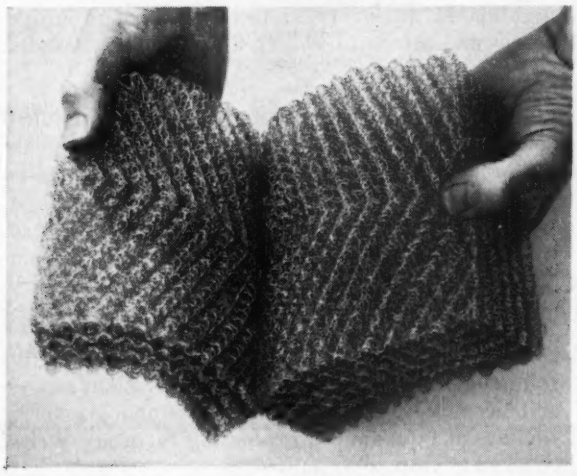


FIGURE 1
STANDARD UNIT

Sections of Standard (Fig. 1) and Herringboned (Fig. 2) Mist Eliminators opened to show the different structures. Each piece is 10 layers thick — 4 layers opened on the left; 6 on the right. Each unit is knitted of .011" diameter stainless steel wire and each is identical in area and weight. Since all entrainment separator mesh is knitted in tubular form, then flattened and crimped, each "layer" shown above consists of two "plies" of mesh. The Herringboned unit, (Fig. 2) is a somewhat thicker unit than the Standard unit. This is because there can be no nesting of the herringboned crimps . . . they touch each other only on the tops of the crimps in each ply making the maximum wire surface area available for impingement of entrained liquids.

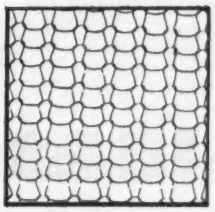


HERRINGBONED UNIT
FIGURE 2

MESH OPENINGS

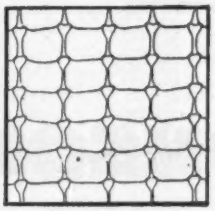
Photograph of a single "ply" (½ a layer) of Standard Mesh (Fig. 3) and the new Hi-Thruput Mesh (Fig. 4) before crimping. Note that both the size and the contour of the mesh openings have been changed.

FIGURE 3



STANDARD OPENING

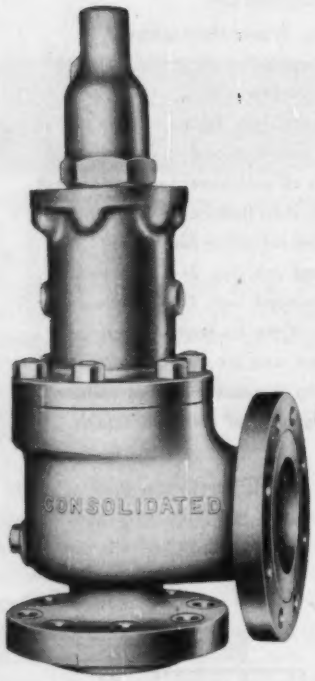
FIGURE 4



HI-THRUPUT OPENING

NOW... CONSOLIDATED SAFETY RELIEF VALVES in economical "2 in 1" design

Peak performance . . . positive valve action assured . . . even where discharge lines are long, or low "superimposed" back pressure exists in the relieving system.



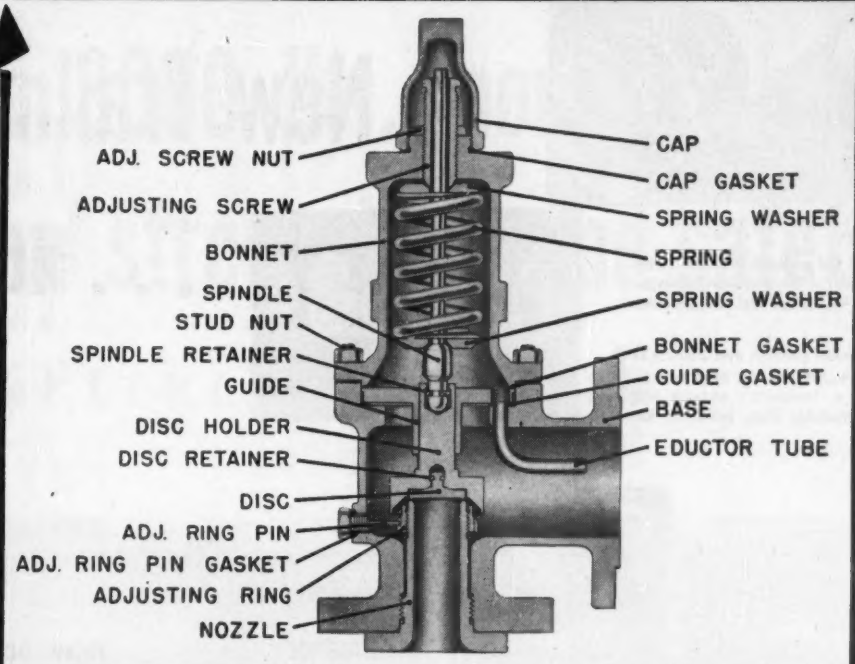
"Two-In-One" design, improved performance . . . the new Consolidated Safety Relief Valve is the result of over 4,000 flow tests in 5 years at West Edmond, Oklahoma. At the A.S.M.E.-approved testing station there, natural gas is available in flow capacities up to 35,000 cfm and pressures up to 500 psig. The A.S.M.E.-approved conditions, apparatus, and procedures permitted Consolidated engineers to test-develop and prove the full range of valve sizes and pressures in both Standard and Bellows designs.

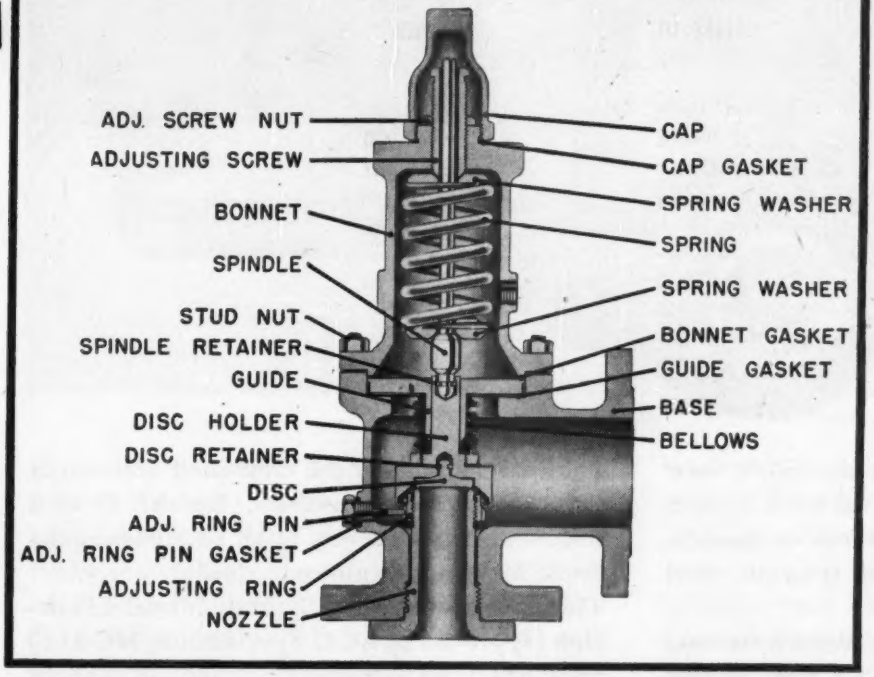
Interchangeability is so highly developed that the majority of Consolidated Standard Valves can be converted to the Bellows design, in the field, simply by installing the bellows. Each type has fewer functional parts than other comparable safety relief valves. Standardization of inlet and outlet center-to-face dimensions permits interchangeability with a large proportion of the valves of other manufacturers. Incorporated is an optically-ground flat seating surface that contributes to easier, more economical maintenance.

You can have the absolute protection and real economy of the thoroughly tried and proved Consolidated Safety Relief Valves for your plant today. Both Standard and Bellows types are available in sizes and pressures to meet requirements of the most advanced processing facilities. Write for full details. Ask for Catalog 1900.

CONSOLIDATED SAFETY RELIEF VALVES

STANDARD VALVE has an eductor tube that holds the pressure in the valve bonnet to approximately atmospheric pressure; thus only the force of the spring controls the valve. Valve action is improved and stabilized . . . repetitive flow capacity is provided . . . a new high in operational dependability is assured. Even under repeated popping of the valve, set pressure and blowdown are consistent. The valve will open to full capacity at 3% overpressure regardless of the position of the adjusting ring.





BELLOWS VALVE is like the Standard but has a durable, two-ply stainless steel sealing bellows which effectively isolates from the valve's working parts any contaminants, corrosion, or viscous fluids. The bellows is balanced with the seating surface: set pressure of the valve is not affected by back pressure, whether constant or variable. Consequently, smaller discharge piping can be used, thus reducing the cost of pressure-relieving systems.

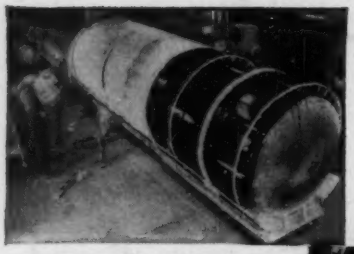
Certified and Approved

Both Standard and Bellows Valves are approved under A.P.I.-A.S.M.E. Unfired Pressure Vessel Codes, A.S.M.E. Unfired Pressure Vessel Code and are certified by the National Board of Boiler and Pressure Vessel Inspectors.

A PRODUCT OF MANNING, MAXWELL & MOORE, INC.

TULSA, OKLAHOMA

MAKERS OF 'AMERICAN' INDUSTRIAL INSTRUMENTS, 'ASHCROFT' GAUGES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN-MICROSEN' INDUSTRIAL ELECTRONIC INSTRUMENTS, *Stratford, Conn.* 'HANCOCK' VALVES, *Watertown, Mass.* AIRCRAFT CONTROL PRODUCTS, *Danbury & Stratford, Conn. and Inglewood, Calif.* "SHAW BOX" AND 'LOAD LIFTER' CRANES, 'BUDGIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES, *Muskegon, Mich.*

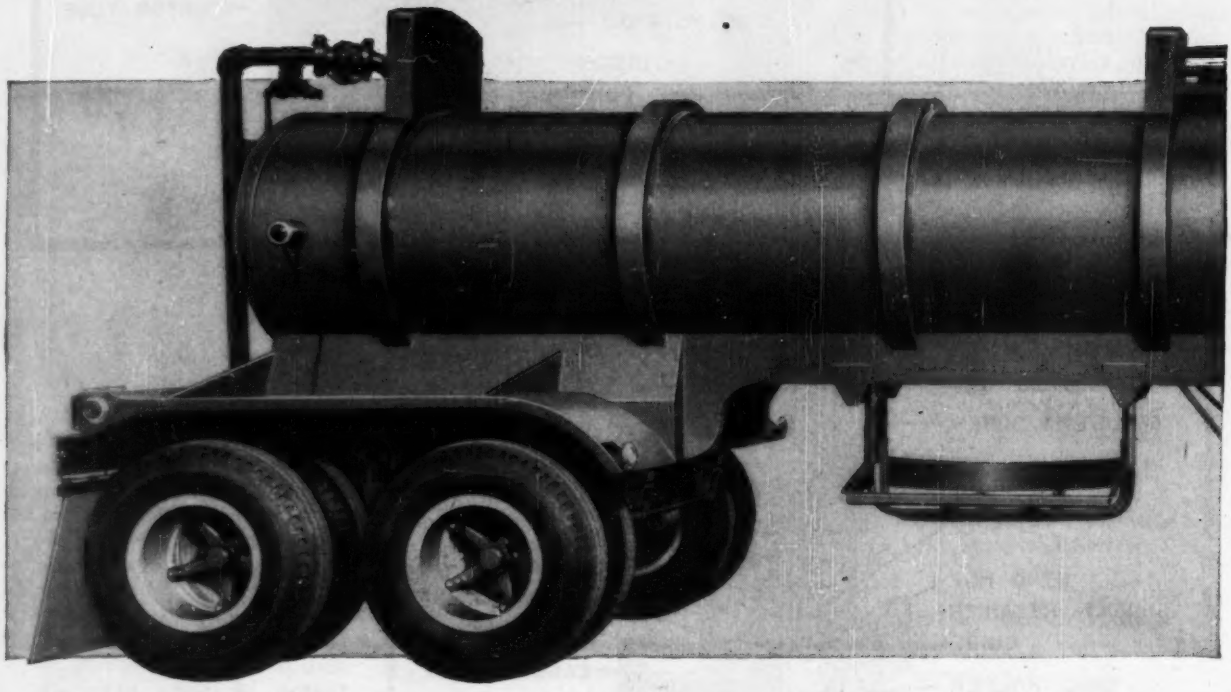


Rigid and continual inspection during assembly of Trailmobile Acid Tanks assure long service life, safe operation.



Continuous automatic weld areas can be seen on new acid tank under construction at Trailmobile's exclusive tank manufacturing plant, Springfield, Mo.

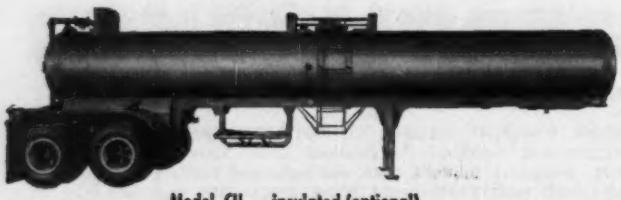
New Trailmobile Acid ...no sacrifice



You can haul more in Trailmobile's new "slimmed down" Model CH Acid Tank Trailer. Model CH is lighter by thousands of pounds, without sacrifice of structural strength, load safety or road handling ease.

Trailmobile's weight-reducing secret is a strong tank shell of 3/16" A.S.M.E. Code Steel, girded by husky "rings of steel." Strong channel members (we call them exterior rings) are welded integrally to the tank shell and sturdy supporting frame members. Result? Overall structural strength equal to all previous regulations! Amazing weight reduction!

This exclusive new Trailmobile Model CH design (approved by I.C.C. Specification MC-311) gives operators extra payload carrying capacity of over 100 pounds for every 100 gallons of capacity built into a tank. A 3000 gallon capacity

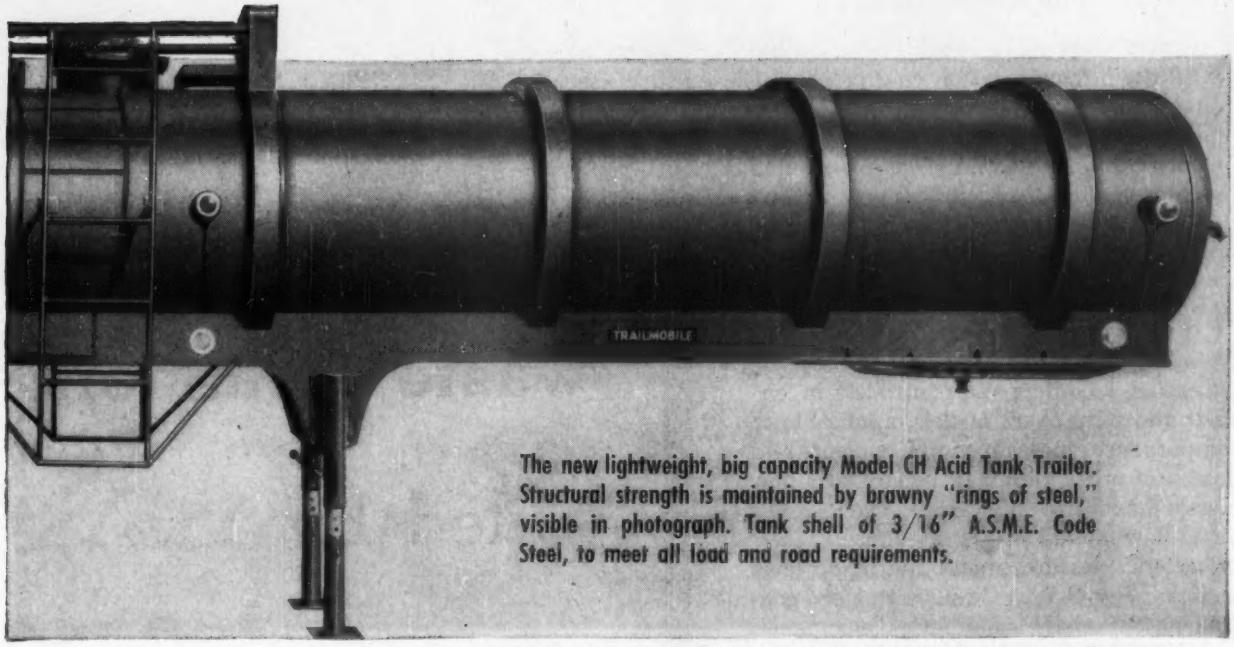


Model CH — insulated (optional)

Trailmobile continues to build heavier gauge tank trailers. Acid tanks are available in many sizes, shapes and designs with special and optional equipment to handle exact hauling problems. Ask about these special tanks.

Tank Gives 3000 lbs. more payload in structural strength or road safety

Available in A. S. M. E. Code Steel or Stainless Steel



The new lightweight, big capacity Model CH Acid Tank Trailer. Structural strength is maintained by brawny "rings of steel," visible in photograph. Tank shell of 3/16" A.S.M.E. Code Steel, to meet all load and road requirements.

Available with unground welds at reduced cost. Also built with stainless steel tank.

tank weighs almost 3300 pounds less than before. You get a bonus of 3300 pounds more payload! What's more, the new Model CH acid tanks encompass every money-saving performance feature of previous Trailmobile models: Walkway mounting brackets; adjustable fifth wheel; full Class A vapor-proof enclosed wiring; wide tunnel drains for easy cleaning; the famous Trailmobile tandem, with 4′, 6′ and 9′ options.

Trailmobile manufactures the Model CH Acid Tank in either stainless or black steel, and with a variety of coatings and linings to handle all types of corrosive and non-corrosive fluids. So whatever your acid hauling problem, see Model CH before you buy. It's your assurance of increased hauling capacity, with utmost safety, economy and profit.

For full information and quotations on the Model CH and other Trailmobile acid tank trailers, mail coupon today. Or call your nearby Trailmobile Branch Office, listed in the yellow pages of your telephone directory.

TRAILMOBILE INC.

The Trend is to **TRAILMOBILE**

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TRAILMOBILE INC.

I would like full information and quotations on the Model CH and other Trailmobile acid tank trailers.

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From one source . . . any instrumentation you need

When it comes to measurement and control, every industrial process is different. Each demands its own combination of accuracy, economy, instrument ranges, and all the numerous other characteristics that are peculiar to the individual application.

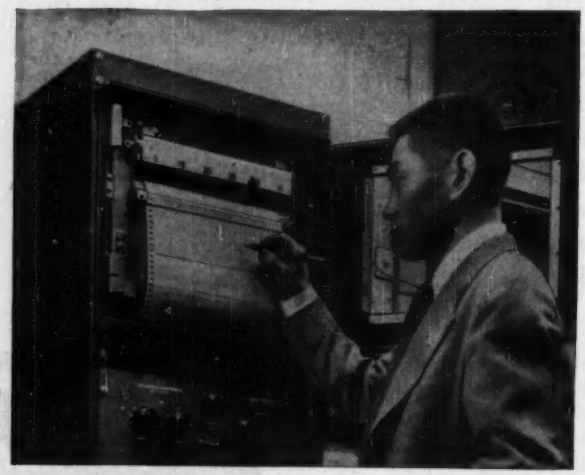
No single instrument and its accessories could possibly fit every process. So Honeywell makes a broad variety of measuring and controlling equipment that spreads across a tremendous range of applications.

The advantages are two-fold. First, you can get all the instrumentation your process requires from a single source, so there is undivided responsibility for the complete installation. And second, you are assured that the equipment selected for your process is recommended without bias . . . neither over-sells nor under-equips . . . needs no stretching, squeezing or compromising to fit it to its assignment.

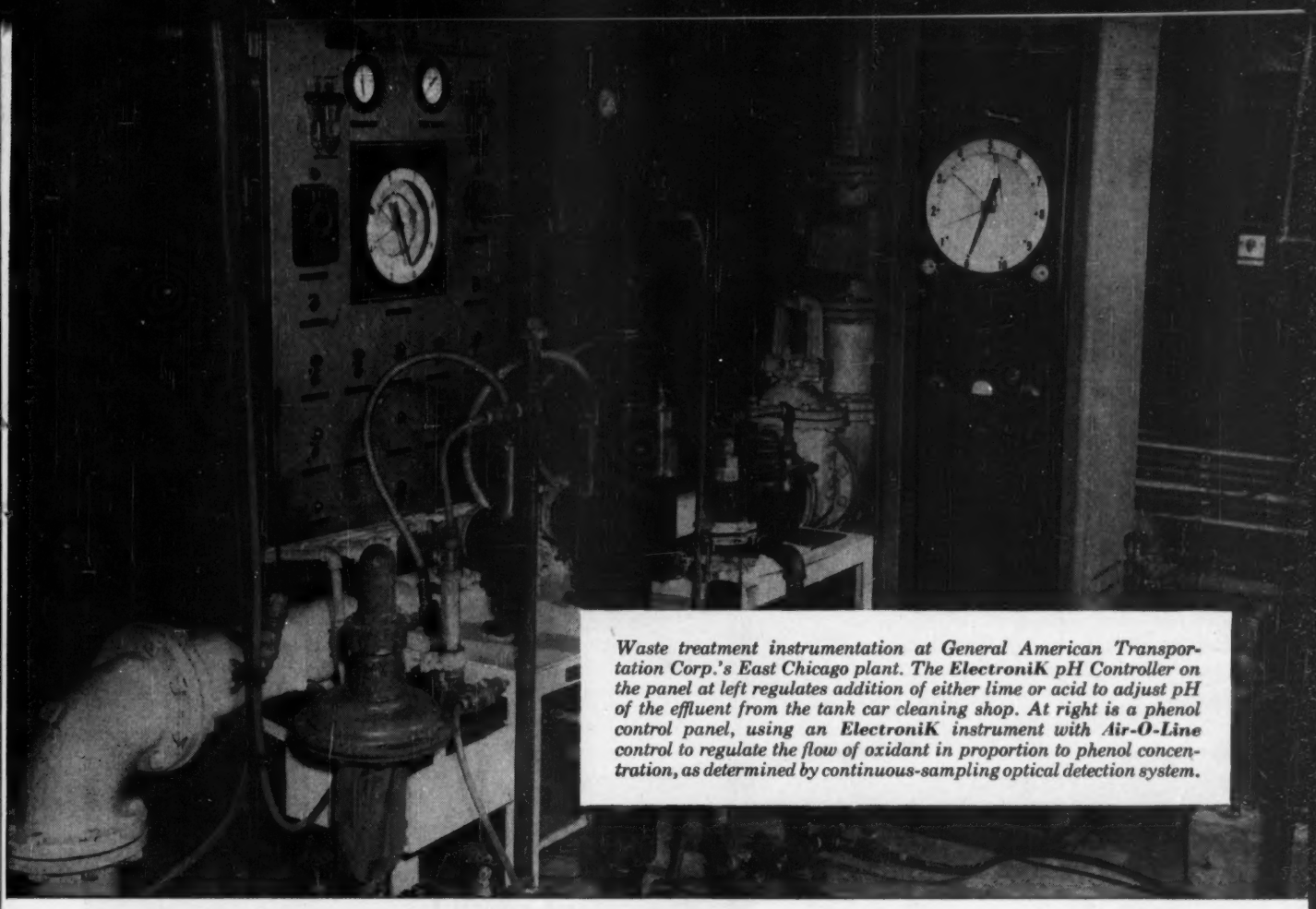
This versatile family includes *ElectroniK* indicators, recorders and controllers in circular and strip chart models, applicable to temperature, pressure, pH, power and dozens of other variables; square root flow meters for control applications; evenly graduated flow meters for cost accounting; thermometers, pressure gauges and liquid level meters; *Pyr-O-Vane* millivoltmeter controllers. Especially useful for graphic panels are the *Tel-O-Set* miniature indicators, recorders and controllers. Electric and pneumatic control systems range from the simplest to the most complex, including automatic program controls and complete systems developed for particular processes.

Working with these instruments is a full choice of primary elements . . . thermocouples, *Radiamatic* radiation elements, pressure-type and electrical resistance thermal systems, flow meter bodies, pH cells and many others. For final control elements, you can choose from a wide range of electric motorized and diaphragm operated valves. To complete the picture, there are more than 7000 non-indicating devices for controlling temperature, pressure, vacuum, liquid level and humidity . . . an unmatched variety of instrumentation made by the world's largest manufacturer of control equipment.

New methods of waste treatment aided by . . . .



Phenol concentration in final effluent at a large refinery is checked by infra-red spectrometer, which utilizes an ElectroniK instrument to record data.



Waste treatment instrumentation at General American Transportation Corp.'s East Chicago plant. The ElectroniK pH Controller on the panel at left regulates addition of either lime or acid to adjust pH of the effluent from the tank car cleaning shop. At right is a phenol control panel, using an ElectroniK instrument with Air-O-Line control to regulate the flow of oxidant in proportion to phenol concentration, as determined by continuous-sampling optical detection system.

ElectroniK instrumentation

MANUALLY regulated, batch-type treatment of industrial wastes is rapidly being superseded by fully automatic, continuous processes that utilize *ElectroniK* instrumentation to the fullest extent. The advancing technology of waste treatment recognizes that this problem is one of chemical engineering—and consequently can benefit by the same processing and control techniques that have sparked progress in production operations.

Instrumentation used by General American Transportation Corporation is an excellent example of modern methods. Used for the treatment of phenol and oil bearing wastes from tank car cleaning, it affords pin-point accuracy capable of detecting phenol concentrations as small as 0.001 part per million. Under control of *ElectroniK* instruments, the process functions continuously with minimum operating costs, reduced storage capacity and peak throughput. The instruments analyze chemical concentration, make a permanent record of effluent characteristics, and automatically regulate the addition of reagents.

Versatile *ElectroniK* instrumentation can help reduce your plant's share of the cost of preventing stream pollution . . . by eliminating the expense of laboratory analysis, reducing treatment plant labor requirements and cutting chemical consumption. Your nearby Honeywell sales engineer will be glad to discuss your waste problem . . . and he's as near as your phone. MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

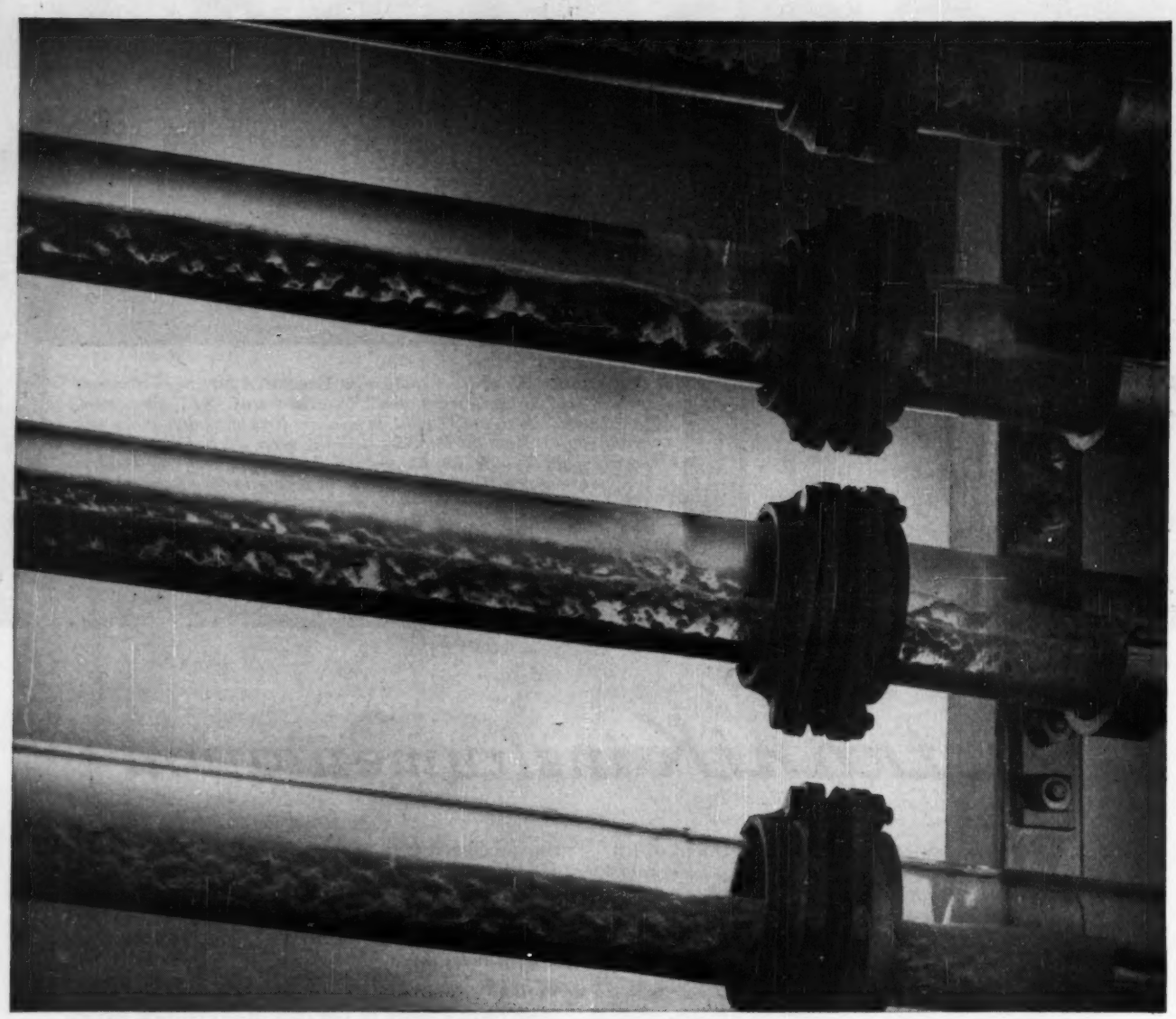
● **REFERENCE DATA: Write for Bulletin 7302, "Instrumentation for Water, Sewage and Industrial Waste Treatment".**

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BROWN INSTRUMENTS

First in Controls

Are you missing the



You'll find that PYREX pipe does a superior job with such acids as sulphuric, hydrochloric, nitric, and acetic; and with such materials as chlorinated hydrocarbons, hydrogen peroxide, bromine, brines, and low-concentration alkaline solutions.

MORE INFORMATION FOR YOU

Space doesn't permit us to describe in detail all the advantages of using PYREX pipe—its clear transparency (you're almost certain to find this a great convenience); how you can plumb it in your own plant to meet any layout requirements; its relatively light weight; comparative costs. So let us send you any or all of the bulletins listed in the coupon on the opposite page.

You need only fill out the coupon and mail it to us for prompt action. Or, if you prefer to discuss your own specific problem immediately with one of our representatives, write, wire, or phone us, or our nearest distributor.

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corrosion resistance of PYREX® pipe because you think it will break?

LOOK what one plant manager says. "There was no breakage during installation. There have been no lines broken because of the product handled, the temperatures involved, or the age of the pipe. There has been no accidental breakage. In short—there has been *no breakage*."

Every "product" line in this plant has been PYREX pipe since 1943. The company switched to PYREX pipe because metal lines were quickly corroded by the acids in the products handled. Corrosion in the metal piping also made cleaning difficult, and the frequent replacements made maintenance very costly.

Thousands of engineers and operating men in hundreds of plants across the country have had the same experience with millions of feet of PYREX brand glass piping. If you are not enjoying the trouble-free corrosion resistance of PYREX pipe, because you are worried about breakage, why not talk to some of the people who are using it daily. We will be delighted to furnish you with the names of companies near you.

You can install it easily

More than 75% of the PYREX pipe now in use has been installed by our customers' own pipefitters. Proper installation is a relatively simple matter; you can plumb it in your own plant to meet any layout requirements. It is easier to hang than many other kinds of corrosion resistant pipe, as there are no special hard-to-catch-on-to tricks about it. Our installation manual covering every detail is yours for the asking. And remember, once your PYREX pipe is in place, you can count on it for a lifetime of service.

Why PYREX pipe today is more durable than ever

The greatest strain on any type of pipeline is usually set up at the joints due to misalignment or lack of flexibility. To offset any such strain, all PYREX pipe ends and fittings (except U-bends) are now tempered, which makes them up to four times stronger than previous fittings. In fact, we know of instances where the metal bolts have been accidentally tightened to their breaking point without the glass yielding. Alignment of lines is also easier now because of improved gasketing materials, inserts and a complete line of spacers and adjustable joints.

Maintenance problems can be reduced

The liquid smooth surface of PYREX pipe does not pit. Deposits do not build up, so your product lines keep up to planned volume. Cleaning is simple, when necessary, as you can see the interior of the pipe at all times. Most users find their pipeline maintenance problems are reduced to a periodic inspection of joints and occasional tightening of flange bolts. One plant superintendent said, "Since PYREX pipe was installed for all of our product lines, maintenance has been practically nil."

RECOMMENDED WORKING PRESSURES—TEMPERATURES

Pipe Size	Maximum Recommended Working Pressure	Maximum Sudden Temperature Differential	Maximum Operating Temperature
1"	50 p.s.i.	200° F.	450° F.
1½"	50 p.s.i.	200° F.	450° F.
2"	50 p.s.i.	200° F.	450° F.
3"	50 p.s.i.	200° F.	450° F.
4"	35 p.s.i.	175° F.	450° F.
6"	20 p.s.i.	160° F.	450° F.

What does it cost?

Initial cost of PYREX pipe compares favorably with most other corrosion resistant piping . . . and it is less expensive than some. Subtracting low installation cost, economical maintenance and long-time service from initial cost puts PYREX pipe on the profit side of your plant budget instead of the cost-of-operating side.

STANDARD SIZES PYREX BRAND GLASS PIPE

I.D., Inch	O.D., Inch	Mean Wall Thick., Inch	Stock Lengths (Feet)	Approx. Weights Lbs./Ft.
1"	1 5/16	5/32	½ to 10	0.6
1½"	1 23/32	11/64	½ to 10	1.0
2"	2 11/32	11/64	½ to 10	1.3
3"	3 13/32	13/64	½ to 10	2.0
4"	4½	17/64	½ to 10	3.4
6"	6 5/16	21/64	½ to 10	6.3

CORNING GLASS WORKS, CORNING, N. Y.

Corning means research in Glass

CORNING GLASS WORKS, 13 Crystal St., Corning, N. Y.

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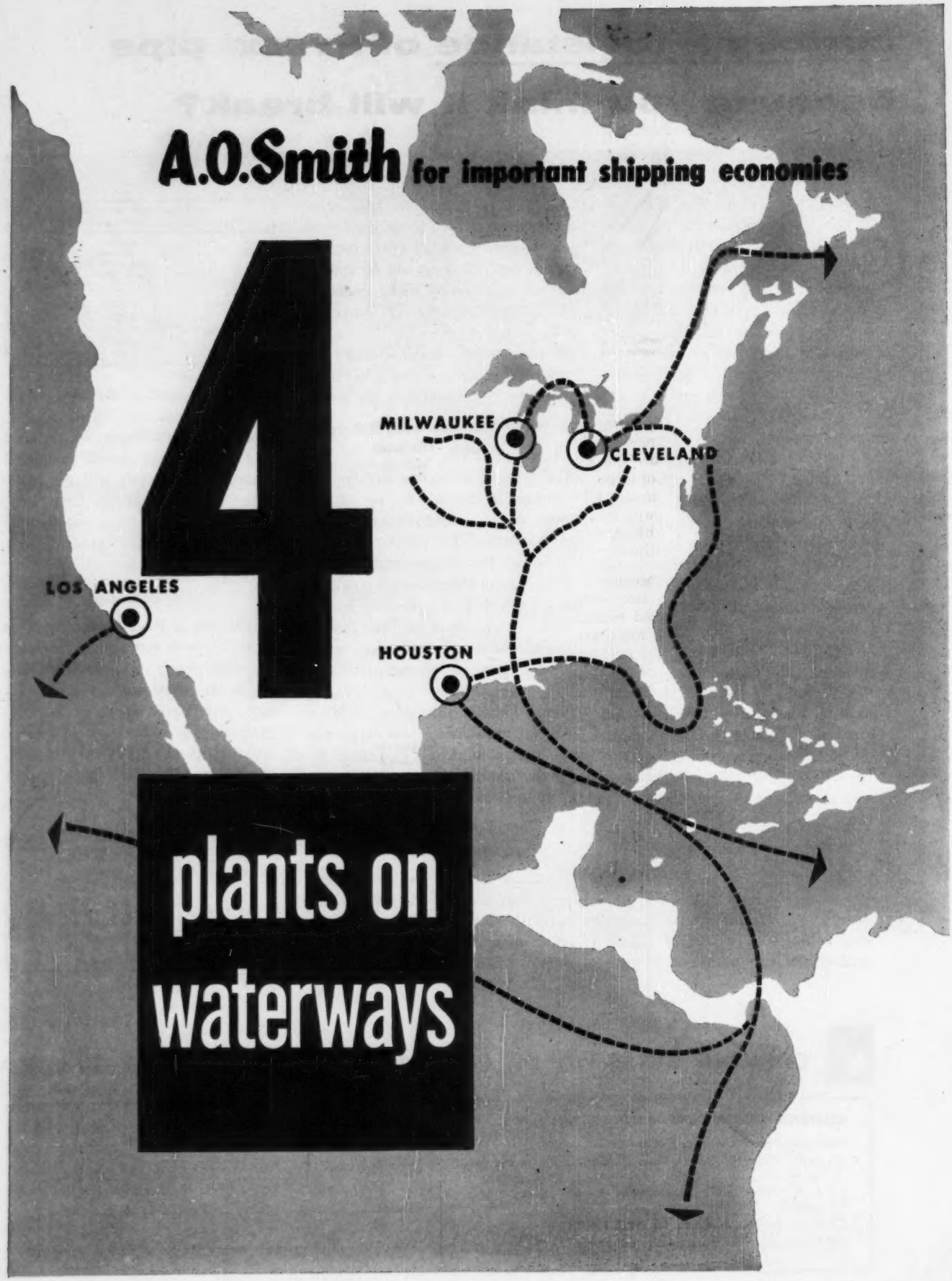
- ☐ EA-1: "PYREX Pipe in the Process Industries" (Illustrated case histories)
- ☐ EA-3: "PYREX brand 'Double-Tough' Glass Pipe and Fittings Catalog"
- ☐ PE-3: "Installation Manual for PYREX Pipe"
- ☐ Please have your representative call on me.

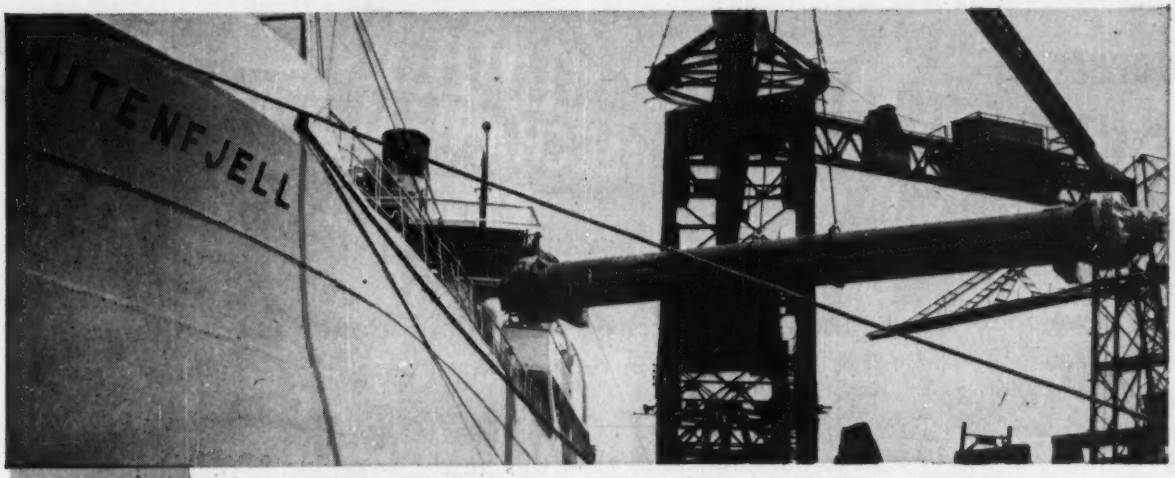
Name..... Title.....

Company.....

Street.....

City..... Zone..... State.....


A.O.Smith for important shipping economies
4
plants on waterways
MILWAUKEE
CLEVELAND
LOS ANGELES
HOUSTON



92,000-lb. synthesis converter being loaded for shipment at Milwaukee to Norsk Hydro Elecktrisk Kvaelstefaktuselskat at Glomford, Norway. Featuring exclusive MULTI-LAYER construction, the unit is 40-ft. face to face, with 31½ in. ID and 3¾ in. wall thickness. Designed to operate at pressures of 3556 psi.

Save on shipping costs . . . because our Milwaukee, Cleveland, Houston and Los Angeles vessel plants are located on waterways . . . because this provides for direct, economical transportation of large pressure vessels and heat exchangers to domestic and foreign ports. If your operations are near waterways, you can well imagine the advantages inherent in this strategic location of A. O. Smith manufacturing facilities.

Erection problems reduced . . . because waterway shipment permits delivery of fractionators, converters, accumulators, stainless and glass-lined reactors, as well as other larger vessels in one or, at most, two pieces. You can avoid field assembly costs . . . or, at least, reduce them considerably. The overall result is welcome economy in time and money.

Another good reason why it pays to see A. O. Smith first when you contemplate the purchase of pressure vessels and heat exchangers. We'd be glad to tell you about some of the other good reasons why it's good business to deal with A. O. Smith. Your letter to our Milwaukee office will bring a prompt reply.

Through research ...*a better way*

A.O.Smith

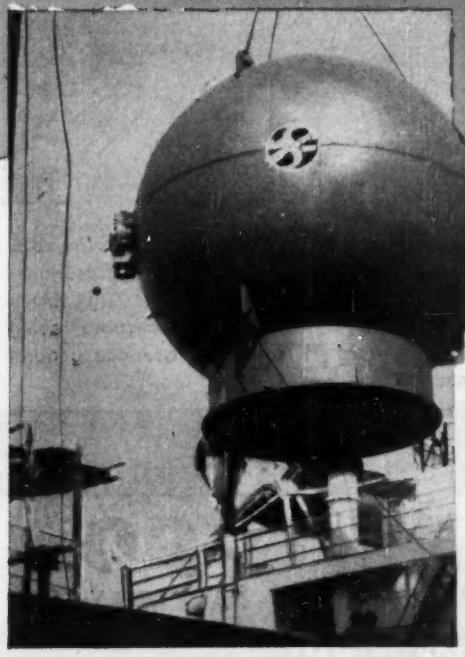
CORPORATION

PROCESS EQUIPMENT DIVISION

MILWAUKEE • HOUSTON • LOS ANGELES

International Division: Milwaukee 1

for glass-lined process equipment, contact GLASCOTE PRODUCTS, INC., Cleveland 17, Ohio an A. O. Smith Subsidiary.



This furfural digester, produced at A. O. Smith's Houston plant, is being loaded aboard a freighter for shipment to the South Porto Rico Sugar Trading Corporation, La Romana, Dominican Republic. Weight is 73,780 lbs. . . . diameter is 20 ft. . . . walls are 1-in. thick.



Weighing 181,200 lbs. each, these giant coking drums are being barge-loaded at Milwaukee for shipment to the Pure Oil Company's installation at Toledo, Ohio. Shipping route is up Lake Michigan, through the Mackinac Straits, along Lake Huron to Lake St. Clair . . . then to Toledo by way of the Detroit River and Lake Erie.

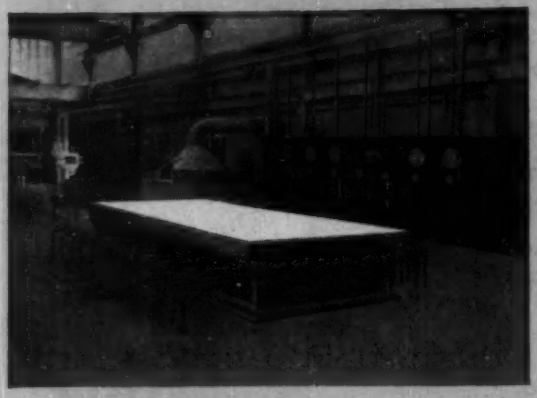
KELLEY

Pioneers in HOMOGENEOUS LEAD BONDING

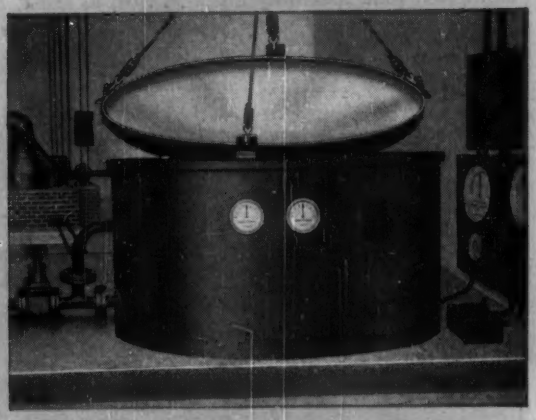
First Again with a "NEW MECHANICAL"* Bonding Process

*Our newly developed "mechanical" process for applying **Homogeneous Lead Bondings** affords you a considerable saving in both delivery time and cost over the slower "hand-burning" method.

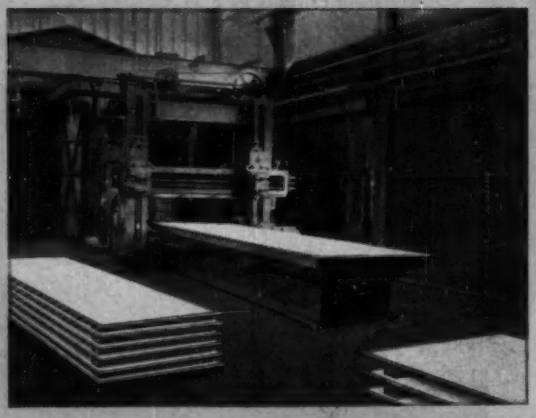
We suggest that you pay a visit to our plant and view this newly developed "Mechanical" cost-saving lead bonding process. Our Engineers are available for consultation without obligation. Your inquiries are solicited.



Homogeneous Lead Bondings are applied to any thickness of shell plates in the flat before shaping to your specifications. Plates as large as 10'-0" x 20'-0" are easily handled on our new unit, thus eliminating many unnecessary weld seams. Outlets and connections are Homogeneously Bonded regardless of size.



To insure uniform overall thickness of the Homogeneous Lead Bondings and eliminate the human errors occurring in other methods, lead is applied "oversize" to flat sheet plates and then planed to required thickness. In addition, this operation affords considerable savings in time over the general "Hand Scraping" method.



Dished Heads of all types and various irregular shaped pieces of equipment are Homogeneously Lead Bonded in our Special "MECHANICAL" Unit. Here again, considerable saving in time and cost is effected over the general method.

KELLEY Custom-Built for the Processing Industries

TANKS · LEAD COILS · LEAD & LEAD LINED VALVES
SHEET LEAD LININGS · CASTINGS & FITTINGS

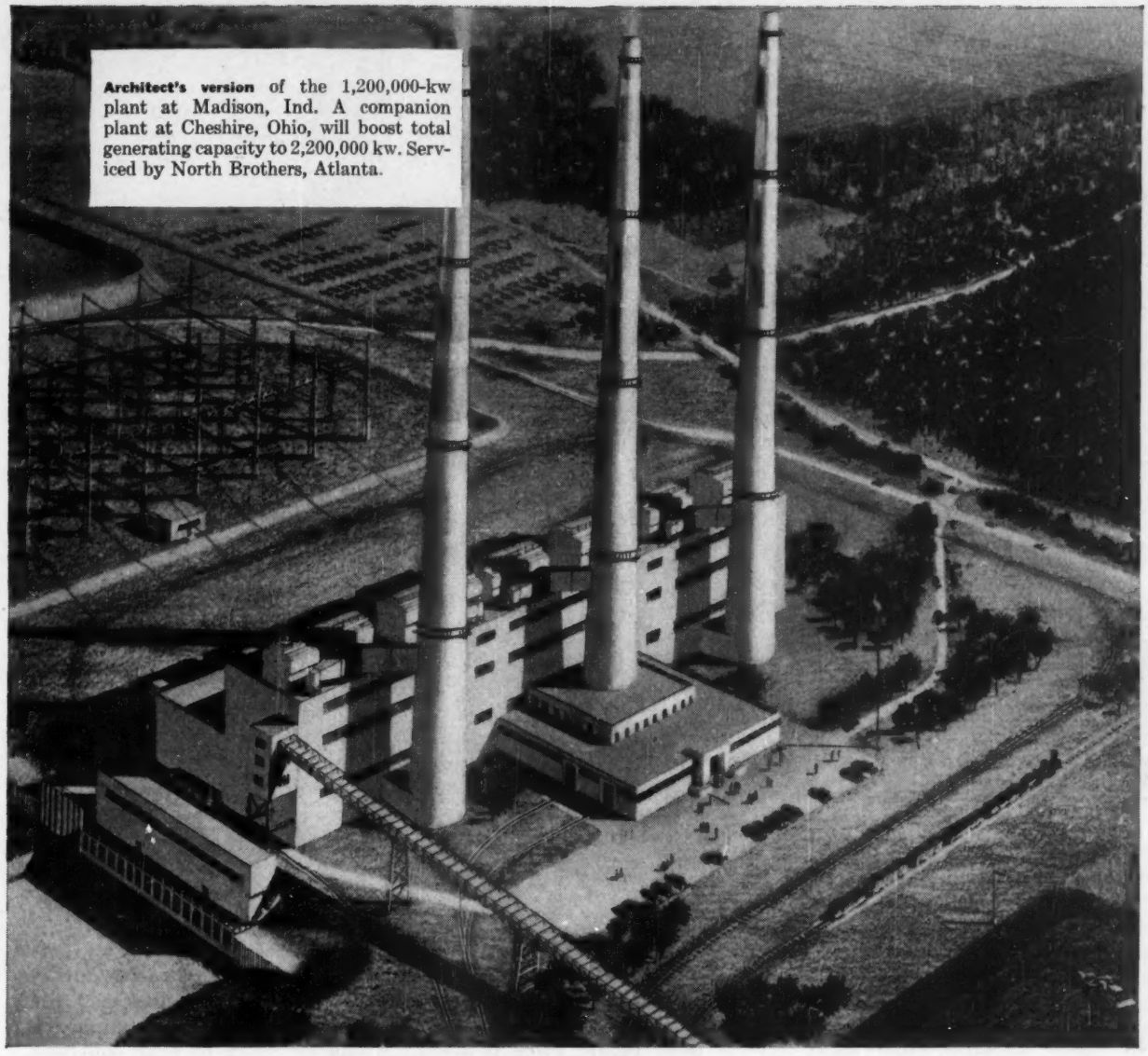
STAINLESS STEEL
LEAD
WOOD
STEEL
Fabrication

O. G. KELLEY & CO.

ENGINEERS DESIGNERS FABRICATORS

96 TAYLOR STREET, BOSTON 22, MASS.

CLEVELAND, OHIO
JOHNSON CITY, TENN
NEW YORK, N.Y.
HOUSTON, TEXAS
PITTSBURGH, PA.
ELIZABETH, N.J.



Architect's version of the 1,200,000-kw plant at Madison, Ind. A companion plant at Cheshire, Ohio, will boost total generating capacity to 2,200,000 kw. Serviced by North Brothers, Atlanta.

PICKED FOR TOP ELECTRIC PROJECT

Fiberglas and Kaylo selected for $4,000,000 power insulation contract

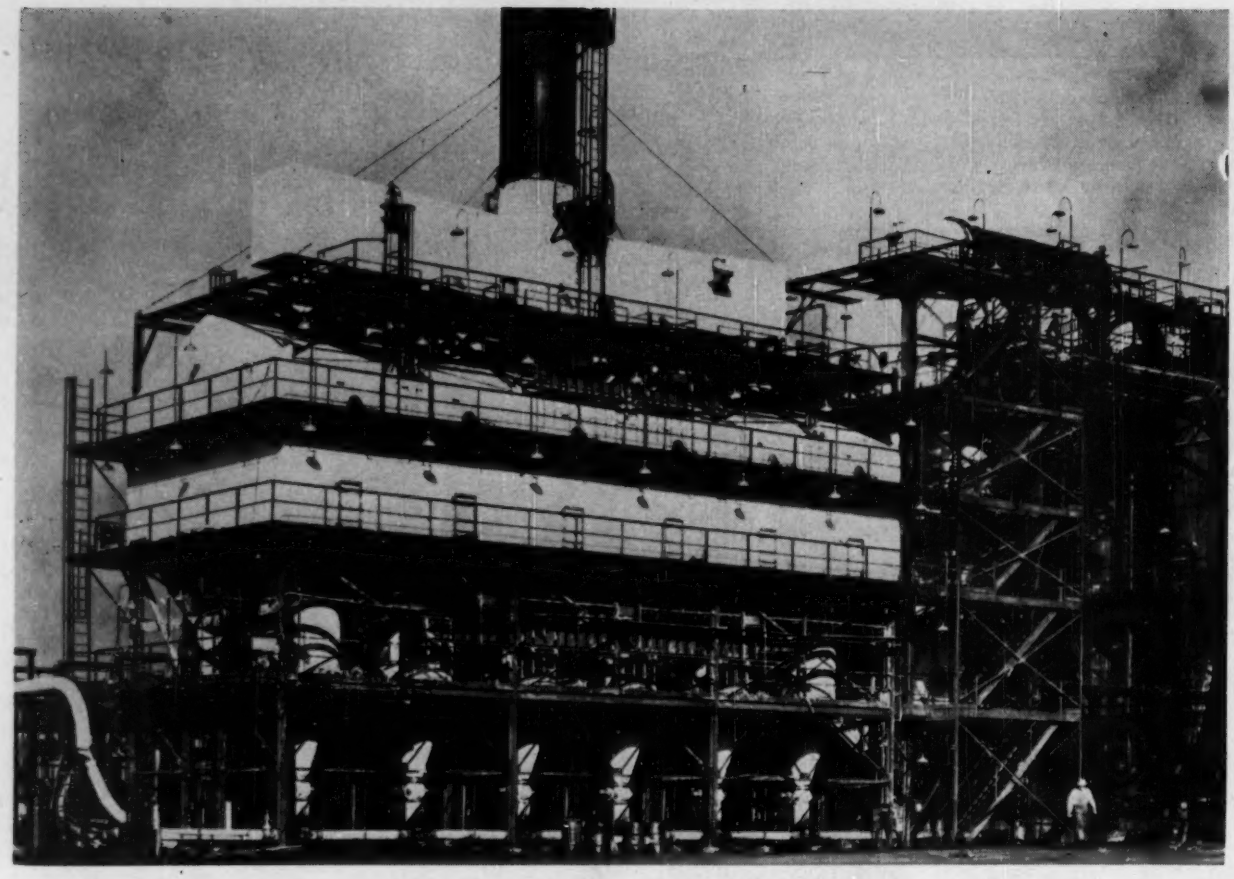
Fiberglas* and Kaylo® insulations will contribute importantly to the efficient, economical functioning of two tremendous steam-electric power plants being built by the Ohio Valley Electric Corporation. OVEC was organized by 15 private electric utilities to provide the full electric requirements of the Atomic Energy Commission's new diffusion plant near Portsmouth, Ohio—power which will come from the 1,200,000-kw Clifty Creek Plant at Madison, Ind., and the 1,000,000-kw Kyger Creek Plant at Cheshire, Ohio. This $4-million insulation contract is thought to be the largest of its kind in electric utility industry history.

Fiberglas and Kaylo are outstanding in thermal efficiency—exceptionally strong, moisture-resistant, dimensionally stable, light in weight, easy to apply. They can even be re-used after removal for inspection. Together, they offer the most complete and versatile line of plant insulations available, ranging from lowest sub-zero to 1200° F. (Kaylo is now distributed by Owens-Corning Fiberglas Corp. Available in quantity.)

For full technical data, refer to Sweet's File, Chemical Engineering Catalog or Refinery Catalog—or write direct to Owens-Corning Fiberglas Corporation, Dept. 97-C, Toledo 1, Ohio.

OWENS-CORNING FIBERGLAS

*T. M. Reg. Owens-Corning Fiberglas Corporation



A Clean Stack with Carbon Black

What Dustube® Efficiency Means in the Chemical Industry

No visible discharge from stacks equipped with Dustube Collectors at this carbon black plant of a prominent chemical processing concern. Virtually 100% recovery of extremely fine particle size carbon black is accomplished by the Dustube cloth-tube-type collector filtering the material from the hot gases.

Similar units are installed in other carbon black plants of this organization in its progressive policy to eliminate air pollution and salvage valuable processing dust. Practically every other carbon black producer also depends upon the Dustube for handling this "tough" problem — one company has 43 units in operation for various dust and fume applications.

Filtration efficiency like this is typical of the Dustube Collector in the chemical industry because it is the most dependable method of dust removal that will ensure a "clean stack" under a wide variety of operating conditions.

With the new synthetic fabrics, the high efficiency Dustube can now be used under temperatures and corrosive applications heretofore beyond the scope of cloth collection. If you are considering any dust or fume control equipment it will pay you to investigate the Dustube — the dust collector that combines simplicity, efficiency and dependability.

Dustube engineers will be glad to show you how your dust and fume problems can be solved with the highest efficiency and at the lowest possible cost. Write today for your copy of Catalog 372.

American WHEELABRATOR® *trail blazer of industrial progress*

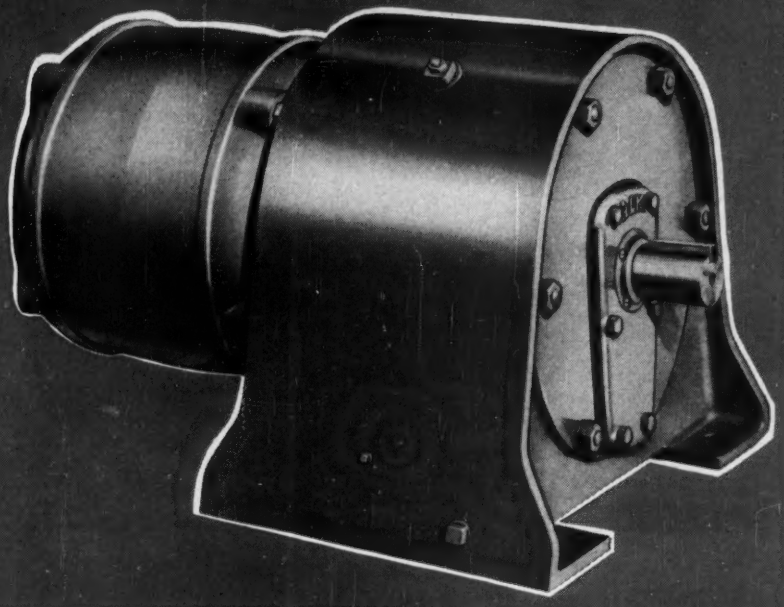
AMERICAN WHEELABRATOR & EQUIPMENT CORP., 347 S. Byrkit St., Mishawaka, Indiana

Announcing the *-Newly Designed-* Integral

ALL-STEEL FALK Motoreducer

(Gearmotor Type–Supplementing Falk All-Motor Line)

. . . with completely standard round-frame, D-flange motor



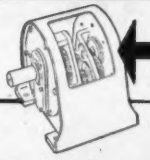
Check and Compare these features...

Meet a faithful old friend in a new, modern dress! The famous, time-proved Integral Type *all-steel* Falk Motoreducer (Supplementing Falk All-Motor Line) has been redesigned into a compact, streamlined unit providing the utmost in space economy—but retaining all the application versatility, long-life performance, easy-maintenance features and superior structural qualities that have made Falk Motoreducers the recognized standard throughout industry.

In this new Integral unit—rated in accordance with AGMA standards—a *completely standard* round-frame, D flange NEMA motor is mounted directly on the all-steel Motoreducer housing. The motor remains a separate piece of equipment, readily replaceable with any other type or make. Output speed (ratio) can be changed within unit's torque capacity without modifying motor. Size and arrangement of the standard housing permit wide ratio range—from 3.36:1 to 542:1.

In order to meet the greatest number of industrial application needs, the newly designed Integral Motoreducers are available in horizontal and vertical models, both in concentric and right-angle types; double, triple and quadruple reduction; horsepower range, 1 to 40 HP. Prompt stock shipment in standard ratios is offered.

Whatever your reduction requirements, you get greatest dollar-for-dollar value in the long run by standardizing on Falk products. Write for Bulletin 3104.



Every FALK Motoreducer has these "In-built" Factors—

Precision Gearing. Heat treated alloy steel, precision cut and shaved helical gearing throughout . . . quiet-operating crown shaved pinions . . . taper bored gears for easy ratio changes.

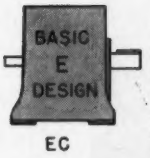
All-steel Housings. Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.

Streamlined inside and outside. Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

Positive Lubrication. Large sump capacity . . . oil-tight construction assures clean lubricant . . . direct dip of revolving elements provides positive lubrication at all speeds.

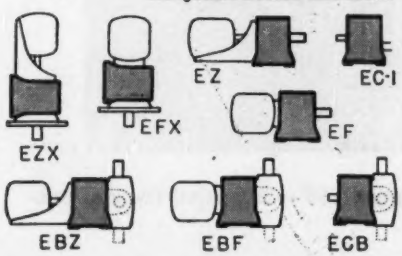
Wide Speed Range. Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

Sealed Housings. Dual closures and one-way vents keep oil *in*, dust and moisture *out*. Units are splash-proof, leakproof, dustproof.



EC

The basic E design permits maximum use of standardized parts . . . closer control over materials, processing, inspection and assembly . . . resulting in faster delivery from interchangeable stocked assemblies.



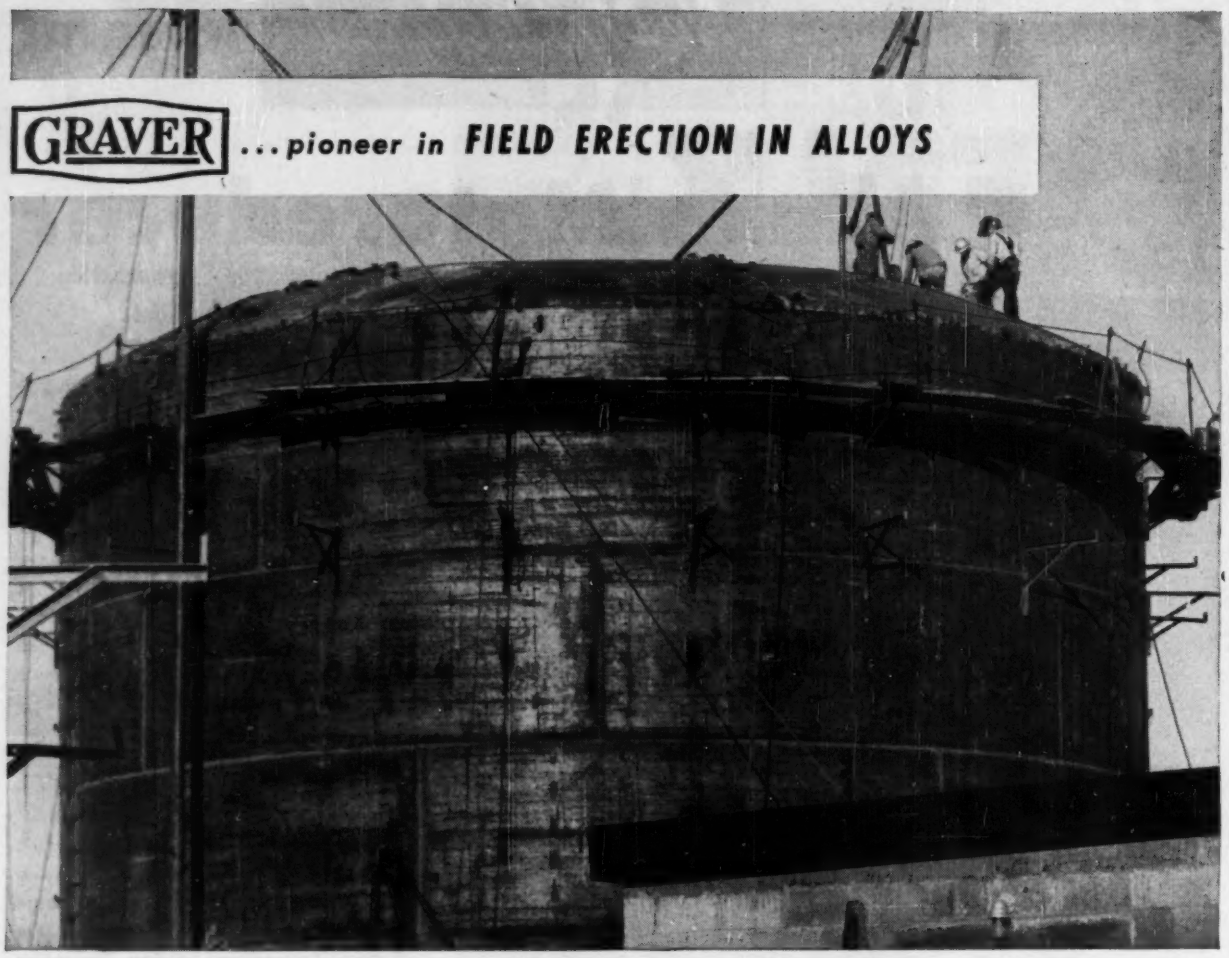
FALK

. . . a good name in industry

THE FALK CORPORATION . 3001 W. Canal St.. Milwaukee 8, Wis.

WRITE FOR BULLETIN 3104

GRAVER ...pioneer in FIELD ERECTION IN ALLOYS

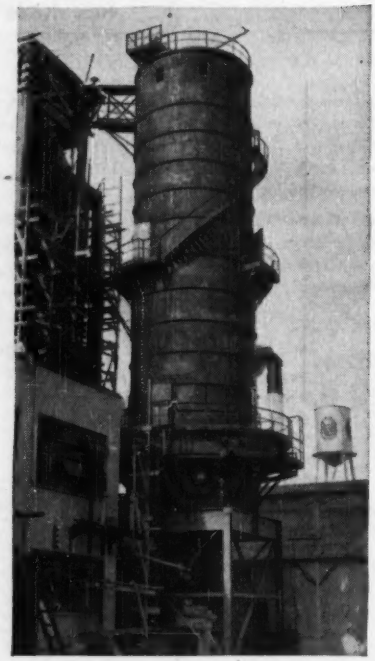


When Seeking a Source...

Consider the wealth of experience Graver has gained in field erection in alloys . . . experience that dates from the birth of alloys. It is standard procedure for Graver to build large, site-erected tanks, towers and process vessels of every size and description—like the large nickel-clad tank for storing caustic shown above, and the intricate spray tower on the right.

Both in this country and abroad, Graver has acquired a reputation for fine craftsmanship, plus a unique ability to more than satisfy customer demands.

For all industries—chemical, petroleum, food, pharmaceutical—Graver fabricates in nickel, stainless, clads and aluminum, as well as in carbon steels. Precision work, painstaking care, intensive inspection methods—these are integral parts of the Graver method. Taken together, they mark Graver as a source worthy of your consideration.

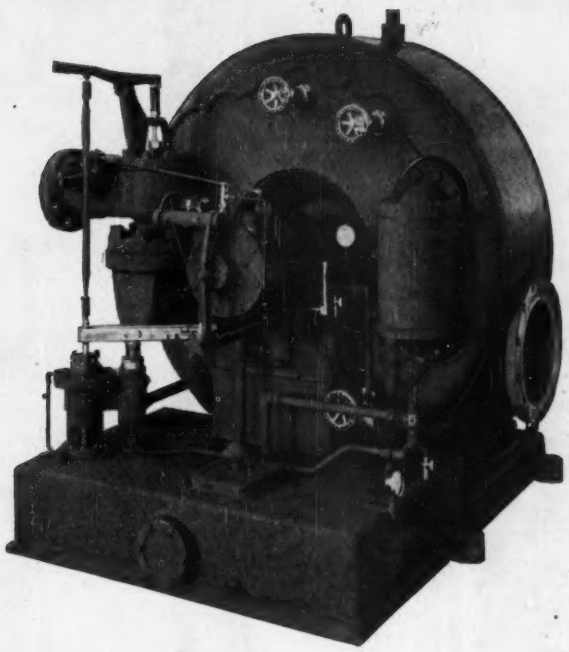


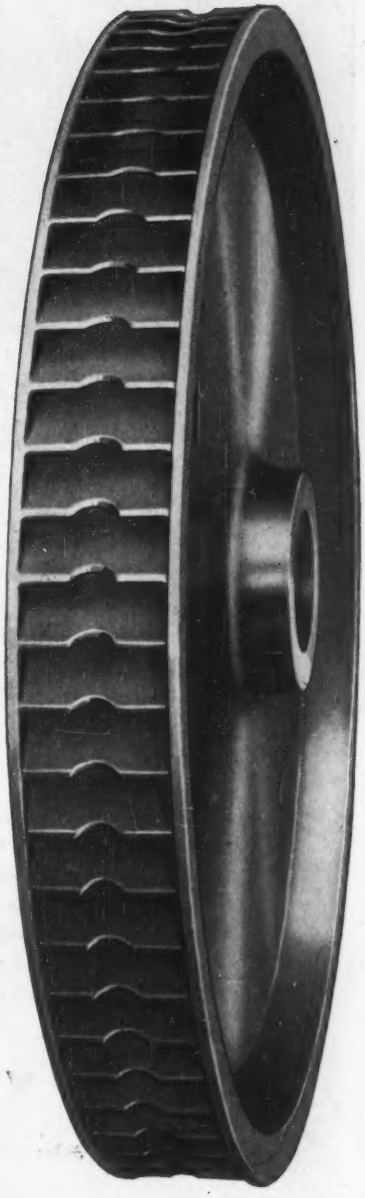
GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

CHICAGO • NEW YORK • PHILADELPHIA • EDGE MOOR, DEL. • ATLANTA • CATASAUQUA, PA. PITTSBURGH • CLEVELAND • DETROIT • TULSA • SAND SPRINGS, OKLA. • HOUSTON ODESSA, TEXAS • CASPER, WYO. • LOS ANGELES • FONTANA, CAL. • SAN FRANCISCO

TROUBLE-FREE TURBINE OPERATION STARTS HERE





Terry solid wheel turbines have become a symbol for dependable, trouble-free operation. The reason—simplicity and ruggedness of construction.

Take the rotor, for instance. It's a solid forging in which a series of semi-circular buckets is milled. There are no separate parts to loosen or work out. Since the only function of the blades is to form a series of pockets, any wear which might occur would not materially affect horsepower or efficiency.

It is impossible for the blades to foul. They have large clearances and are further protected by the projecting rims at the sides of the wheel. As the side clearances are also very large, end play can do no harm.

Simplicity outside too—as you can see from the photograph of the 1500 HP at 3500 RPM solid wheel turbine above. This turbine is equipped with an oil relay governor and forced feed lubrication to the bearings.

For more about these *work horses of industry*, send for a copy of bulletin S-116. No cost or obligation.

THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TERRY

TT-1200



ALL TYPES...ANY CLASS FIRE!

Since different fire hazards require different types of fire extinguishers, PYRENE—C-O-TWO manufactures all types . . . the finest and most complete line on the market today.

When doing business with PYRENE—C-O-TWO, you receive unbiased advice on what is best for your particular fire hazards, whether class A, B or C. Also, there is a well-rounded sales engineering organization having nation-wide representation to render top quality service wherever you're located.

Don't take unnecessary chances . . . the extensive fire protection experience of PYRENE—C-O-TWO over the years is at your disposal without obligation. Get complete facts now!

PYRENE — C-O-TWO

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

COMPLETE FIRE PROTECTION

portable fire extinguishers . . . built-in fire detecting and fire extinguishing systems

CARBON DIOXIDE • DRY CHEMICAL • VAPORIZING LIQUID • SODA-ACID • WATER • CHEMICAL FOAM • AIR FOAM

ERIE CITY
115 Years in Steam Generation

ERIE CITY IRON WORKS · Erie Pa.
STEAM GENERATORS · SUPERHEATERS · ECONOMIZERS · AIR PREHEATERS
UNDERFEED AND SPREADER STOKERS · PULVERIZERS

You can depend on Erie City for sound engineering

A NEW USE FOR STEAM *at* BREA CHEMICALS INC.

designed by BREA CHEMICALS INC.
constructed by C. F. BRAUN & CO.

Brea Chemicals, Inc. at Brea, California applies sound engineering to produce ammonia from air, water, and natural gas.

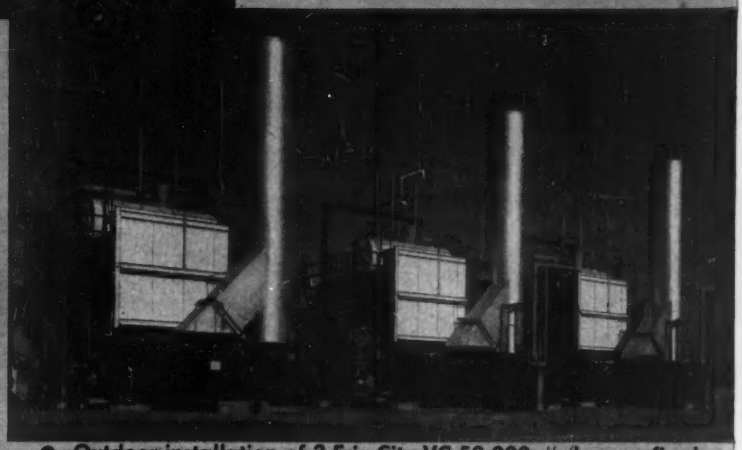
The air is washed clean of carbon dioxide with caustic; compressed, dried, and liquified. The liquid air is fractionated, and the overhead nitrogen product is one of the basic materials for ammonia synthesis.

Water is added to three Erie City VC Steam Generators and becomes steam. Part of this steam reacts with natural gas in a reforming furnace. The effluent gas contains hydrogen, oxides of carbon, and methane. The flue gases from the furnace are used as a source of waste heat to operate two Erie City VL steam generators. The steam from these generators augments plant steam requirements at low cost.

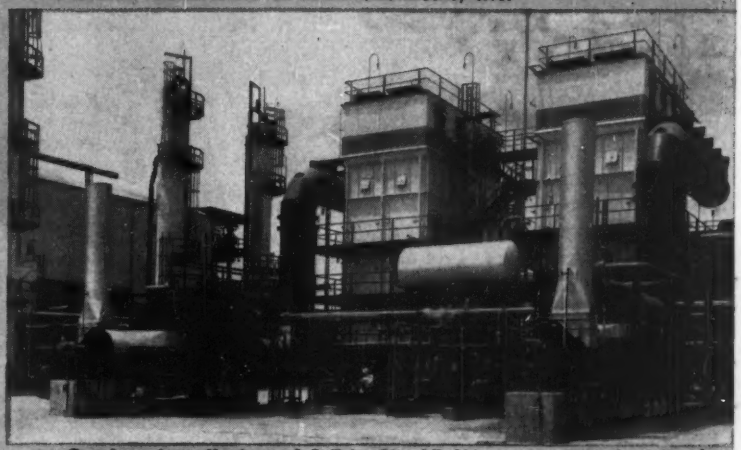
Carbon dioxide is removed from the reformed gas by scrubbing with a liquid amine solution, recovered, and processed to form dry ice. The carbon monoxide and methane are removed by scrubbing with liquid nitrogen. The overhead product from the nitrogen wash column is a mixture of hydrogen and nitrogen ready for the synthesis operation.

Ammonia from the Brea process provides the foundation for servicing the farmer with aqua ammonia, aqua ammonium phosphate, and ammonium sulfate, and in the near future—ammonium nitrate.

Erie City through the application of sound engineering in the design of its products, is proud of the part it plays in this new petrochemical industry.



● Outdoor installation of 3 Erie City VC 50,000 #/hr. gas fired Steam Generators at Brea Chemicals, Inc.



● Outdoor installation of 2 Erie City VL Waste Heat Boilers fired by flue gases from the Reform Furnaces shown above.



● Air view of the Brea Chemicals Inc. Ammonia Plant at Brea, Cal.

100% Corrosion-Proof

A-C. MOTORS



Here is a corrosion-proof chemical motor with enough flexibility to fit *your* requirements. It's *Totally* Protected.

Interesting features about this motor are brought out in detail in a new booklet entitled "From Naphtha to Grain Dust". It's worthwhile reading to find out *why* this motor has won wide-spread recognition in the chemical field.

Get your copy today by mail, or through your local Reliance district sales office or distributor.

B-1400

RELIANCE ELECTRIC AND ENGINEERING CO.

1063 IVANHOE ROAD • CLEVELAND 10, OHIO

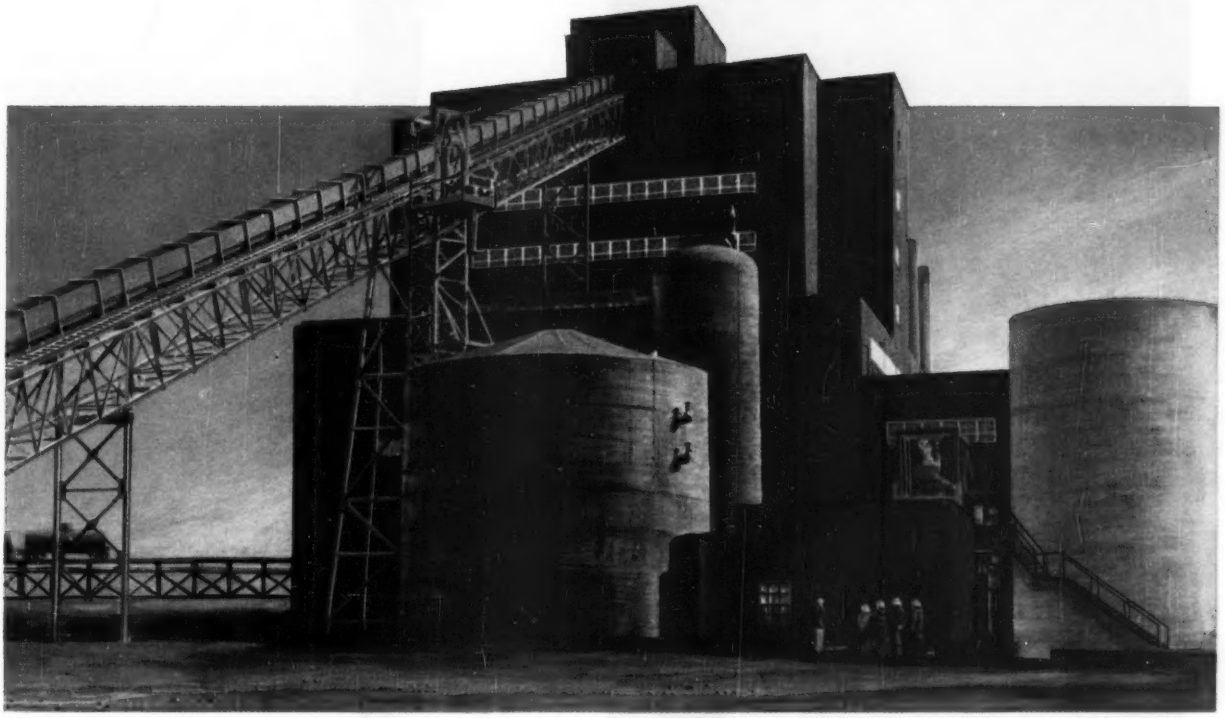
Canadian Division: Welland, Ontario

RELIANCE Precision-Built MOTORS

Builders of the Tools of Automation

RELIANCE V★S DRIVE

NEW PROCESS FOR PULPING HARDWOODS



In Maine's northern Penobscot region, hardwoods are available for paper pulp in plentiful supply.

When Great Northern Paper Company expanded its mill at East Millinocket, Stone & Webster Engineering Corporation was engaged to engineer and design the Company's almost completely automatic Chemi-Groundwood Pulp Mill—the first large commercial chemical plant of its type for removing the resins and lignins in hardwood.

Utilizing information obtained from the client's pilot plant operation, the Chemi-Groundwood Pulp Mill employs pioneer developments and radical departures from accepted practice in the pulp and paper industry.

At Great Northern Paper Company's new Chemi-Groundwood Pulp Mill, hardwood logs are loaded automatically into digesters, cooked in recirculating liquor, dropped into water pools for cooling, leaching and storage, conveyed through a stream barker and thence to grinder. The self-contained mill has its own cooking liquor preparation plant, chemical handling and storage facilities.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

New York Boston Chicago Pittsburgh Houston San Francisco Los Angeles Seattle Toronto

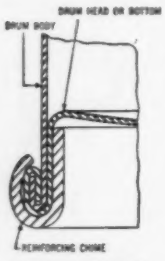
Here are important features that mean big savings with USS Stainless Steel Drums and Pails



1. USS Stainless Drums and Pails give you many times the length of life of drums and pails made of conventional carbon steel because of greater tensile strength, extra durability.
2. USS Stainless Steel Drums and Pails are returnable, can make many trips, reducing considerably the unit cost of your shipping containers.
3. USS Stainless Steel Drums and Pails give complete product protection during shipping or storage . . . stops worry about contamination from rust, scale, grease or dirt.
4. USS Stainless Steel Drums and Pails stay clean and new looking inside and out. This is important in promoting customer confidence. And products that require sanitary containers are dependably safe in USS Stainless Steel Drums and Pails.

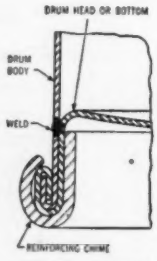
These containers are available in both tight and removable head construction.

USS Stainless Steel Drums are available with durable rubber rolling hoops (as illustrated) that give extra protection to both the drum and its contents from bumps and shocks, prolong the life of the drum, make handling much easier and quieter, and keep the drum from marking and marring floors.



CONVENTIONAL DOUBLE SEAMED REINFORCED CHIME CONSTRUCTION

Our special patented construction seals off the inner crevice or opening that usually results from the conventional double seam construction. This prevents the contents of the drum from entering the double seam and being trapped within the crevice, making it easier to do a thorough cleaning job.



CONVENTIONAL CONSTRUCTION WITH CREVICE CLOSING WELD

* * *

United States Steel Products fabricates stainless, galvanized, tinned, painted and decorated drums and pails . . . furnished in a wide range of capacities and with a variety of fittings and openings to meet every industrial need. If you would like any additional information on USS Steel Drums or Pails, just write to us at New York.

"It's Better to Ship in Steel"

UNITED STATES STEEL PRODUCTS DIVISION

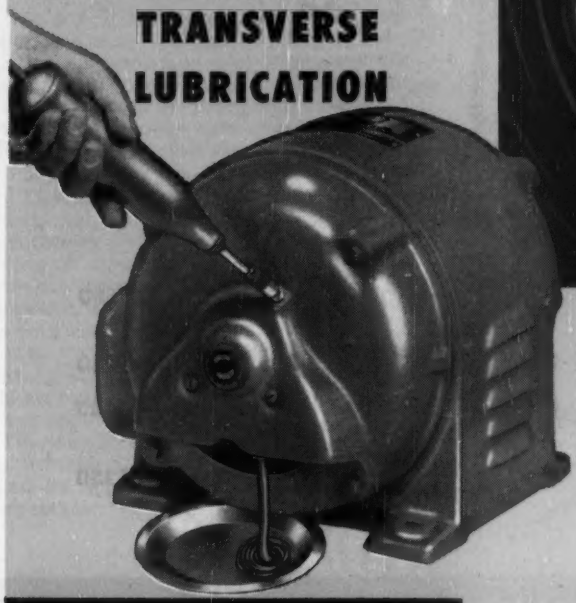
UNITED STATES STEEL CORPORATION
DEPT. 235, 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
Los Angeles and Alameda, Calif. · Port Arthur, Texas
Chicago, Ill · New Orleans, La. · Sharon, Pa.
*Camden, New Jersey

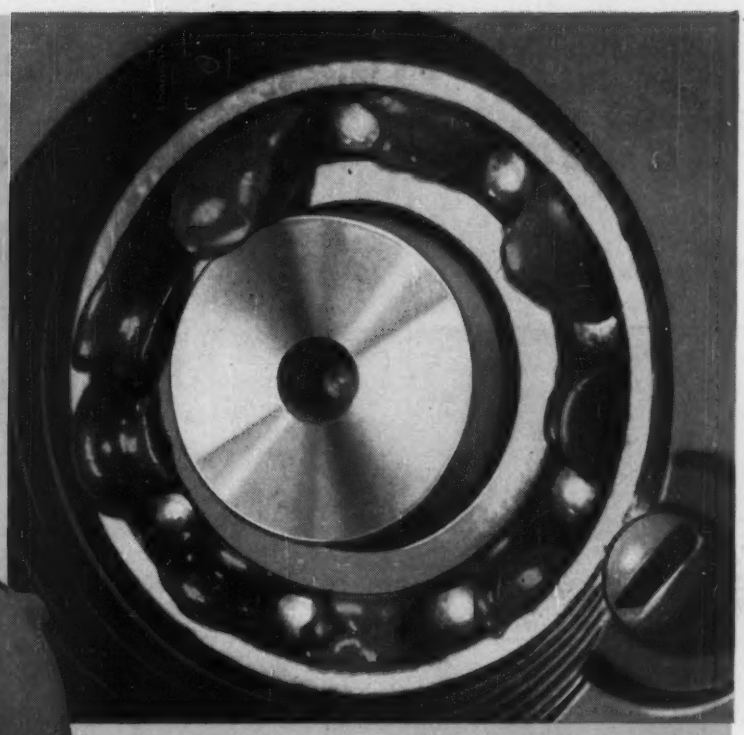
**Expected Completion in April 1955*

USS STEEL DRUMS

UNITED STATES STEEL

Motor life vastly increased with U. S. MOTOR TRANSVERSE LUBRICATION





See how it works. The above cut-open view shows how grease extrudes through the bearing transversely when grease gun is applied, forcing old grease out and replacing with fresh new lubricant. Lubriflush is an exclusive U. S. Motors system, proved by 20 years' application.

U. S. MOTORS

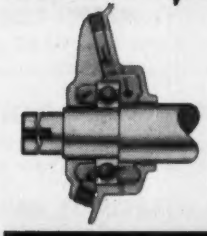
Lubriflush

THE ONLY SYSTEM OF COMPLETE RE-LUBRICATION

without disassembly of motor!

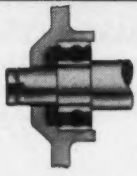
Motor bearing failure is costly. Bearing life is limited to the life of its lubricant. Therefore re-lubrication is a *must*. But to completely re-lubricate any ordinary bearing you have to open up the motor. That costs money – in man-hours and down-time. *The solution* – Install U. S. Motors. Just apply a grease gun once a year. The injected grease is applied *behind* the bearing and is forced transversely through the bearing, ejecting all the old grease out the drain. How simple. How quick. How economical.

Lubriflush BEARING



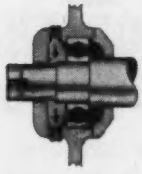
See how the lubricant is applied behind the bearing. It has to go THROUGH the bearing. No dead areas. Largest grease volume surrounds bearings—up to 12 times more than ordinary types.

ORDINARY BEARINGS



CARTRIDGE TYPE

Limited in volume of grease. When grease fails, bearing must be replaced.



STANDARD TYPE

Does not replace worn grease on blind side of bearing.

U.S. ELECTRICAL MOTORS, Inc.
Los Angeles 54, California • Milford, Conn.

GET THIS BOOKLET ON MOTOR LUBRICATION

A real refresher course on motor lubrication. Tells all about motor bearing greasing. Fact-packed pages reveal engineering data that will amaze you. It's free. Send Coupon.

Request for Lubriflush Booklet

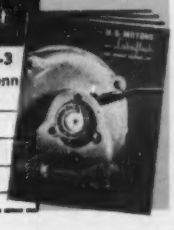
U. S. Electrical Motors Inc. CE-3
Box 2058, Los Angeles 54, Calif. or Milford, Conn

NAME_____

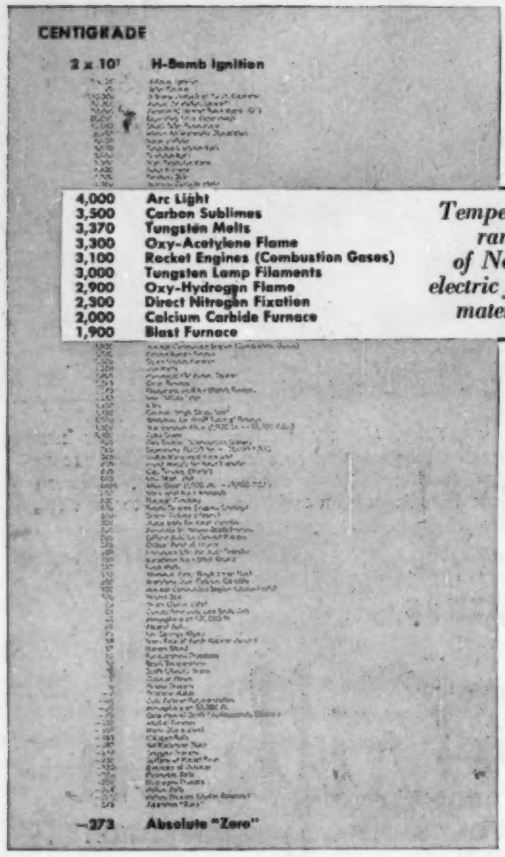
COMPANY_____

ADDRESS_____

CITY_____ ZONE___ STATE_____



Norton materials for high temperature processing



Temperature range of Norton electric furnace materials

C° Melting Point	Temperature of Electric Arc Furnace 4000° C–7230° F	F° Melting Point
3540	ZIRCONIUM CARBIDE ZrC	6400
3300	FUSED THORIA ThO_2	5970
3140	TITANIUM CARBIDE TiC	5680
3060	ZIRCONIUM BORIDE† ZrB_2	5540
3000	BORON NITRIDE BN	5430
2900	TITANIUM BORIDE† TiB_2	5250
2700	FUSED ZIRCONIA ZrO_2	4900
2620	MAGNORITE* Fused Magnesia MgO	4750
2450	NORBIDE* Boron Carbide B_4C	4440
2300	CRYSTOLON* Silicon Carbide SiC	4170
2000	38 ALUNDUM* Aluminum Oxide Al_2O_3	3630
1900	REGULAR ALUNDUM Aluminum Oxide Al_2O_3	3450

Not True Color Temperatures

†Experimental Materials

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

Are You Stymied by a "High Temperature Barrier?"

Are you concerned with industrial processing involving temperatures ranging upwards to 4000° C? If so, Norton Company has developed and is continually improving materials — produced and purified in electric arc and high temperature resistance furnaces — which may help you solve difficult technical problems. Norton Company supplies these materials in crude, processed or fabricated form — and will work with you in engineering them to your requirements. For further information, write to NORTON COMPANY, Refractories Division, 502 New Bond Street, Worcester 6, Mass.

Making better products . . . to make other products better

NORTON
REFRACTORIES
Engineered . . . Rx . . . Prescribed

NEW!
ARMCO ALUMINUM-COATED STEEL
for outdoor service

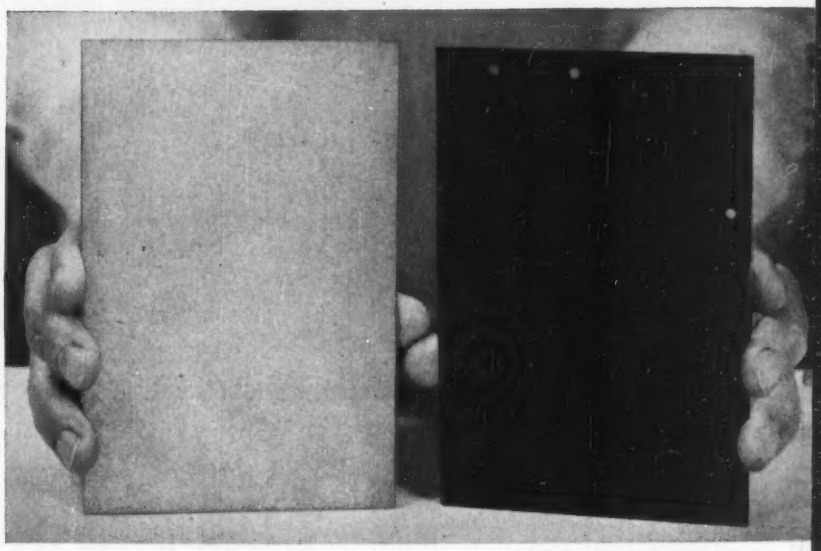
COMBINES CORROSION-RESISTING PROPERTIES OF ALUMINUM WITH STRENGTH OF STEEL

A new hot-dip aluminum-coated sheet steel—known as Armco ALUMINIZED STEEL® (Type 2)—is now in production after 15 years of corrosion testing. It combines the surface advantages of aluminum with the strength of steel.

While zinc coatings have done a good job of protecting steel against rust, tests indicate this new aluminum-coated steel is greatly superior. The 15-year tests in an industrial area show the atmospheric corrosion resistance of this aluminum coating is at least 3 times that of a standard coating on galvanized steel sheets.

During the past year and a half of field development work, ALUMINIZED STEEL (Type 2) has been used in prefabricated industrial, commercial and farm buildings, industrial rolling doors, covers for silos and water storage tanks, roof deck, and other applications under general atmospheric conditions.

The new sheet is a companion grade to Armco ALUMINIZED STEEL (Type 1) exclusively produced by Armco since 1939 for high temperature service.



In atmosphere sufficiently corrosive to cause a standard galvanized coating (right) to fail completely in 12 years, Armco ALUMINIZED STEEL (Type 2), left, looked like this *after 15 years*. Cleaned samples show the aluminum coating is still giving full protection to the base metal.

QUESTIONS YOU MAY WANT ANSWERED

DOES IT "WEATHER" LIKE ALUMINUM?

Yes. The surface of samples of Armco ALUMINIZED STEEL (Type 2) and aluminum, exposed to the atmosphere for five years, cannot be told apart.

WHAT IS ITS STRENGTH?

Because it has a steel base it has the strength and rigidity of steel . . . thus avoiding problems common to weaker materials.

DOES IT REFLECT HEAT?

Yes, ALUMINIZED STEEL (Type 2) offers the same high reflectivity of radiant heat as aluminum—whether from the sun or from low temperature heat sources.

DOES IT RESIST FIRE DAMAGE?

Armco ALUMINIZED STEEL has excellent resistance to fire damage. At 800 F, for example, it has more than ten times the strength of aluminum. Steel has a melting point of 2850 F; aluminum melts at about 1200 F.

WHAT ABOUT FABRICATION?

Armco ALUMINIZED STEEL (Type 2) withstands severe forming without peeling or flaking of the coating. It also can be embossed and spun, but is not recommended for drawing operations.

HOW DOES IT COMPARE IN COST?

Even when considering equal thicknesses, ALUMINIZED STEEL (Type 2) generally costs less per square foot than aluminum. Additional cost savings are possible because the greater strength of the steel base permits use of lighter gages. For example, a fabricator using .050 aluminum could save 40 to 50 per cent of material costs by utilizing the proper gage of ALUMINIZED STEEL.

While the initial cost is somewhat higher than galvanized steel, it is less than the cost of galvanized plus one field coat of paint. Because of its superior atmospheric corrosion resistance, the new aluminum-coated steel needs no paint protection.

If you would like complete information on sizes, gages and prices of Armco ALUMINIZED STEEL (Type 2), just fill in and mail the coupon.

ARMCO STEEL CORPORATION

955 Curtis Street, Middletown, Ohio

Sheffield Steel Division • Armco Drainage & Metal Products, Inc. • The Armco International Corporation

ARMCO®

ARMCO STEEL CORPORATION
955 Curtis Street, Middletown, Ohio

What are sizes, gages and prices of Armco ALUMINIZED STEEL (Type 2)?

We manufacture _____

_____

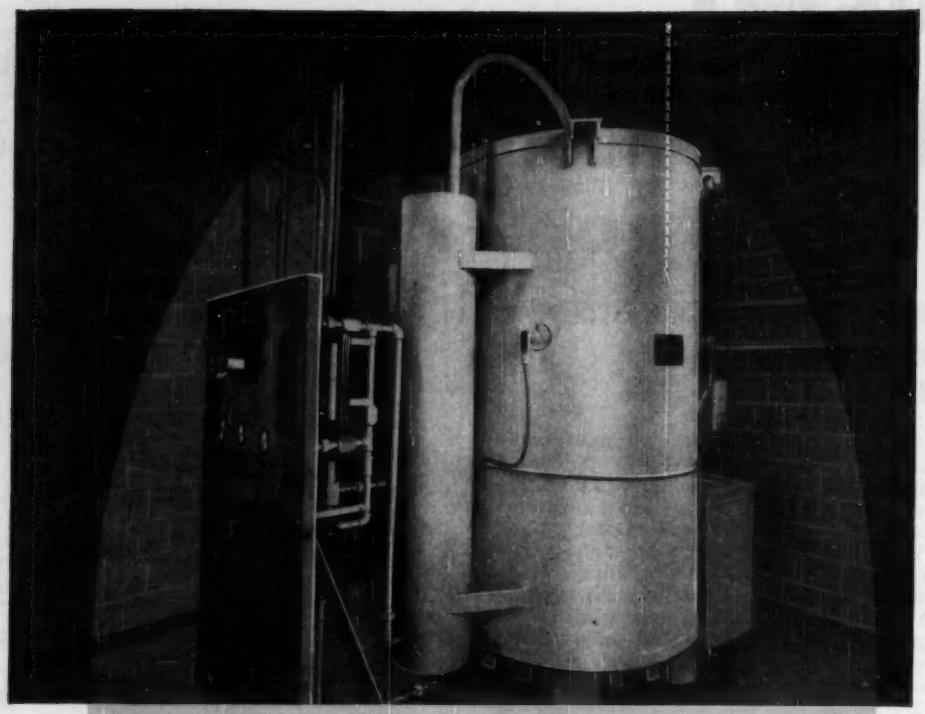
NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____



"Cracked" Ammonia shows tremendous cost saving and unsurpassed performance

1. Hydrogenation of fats and oils
2. Industrial furnace atmosphere for treatment of various metals and alloys
3. Process operations where 25% nitrogen diluent is not harmful

the Drever

Ammonia Dissociator

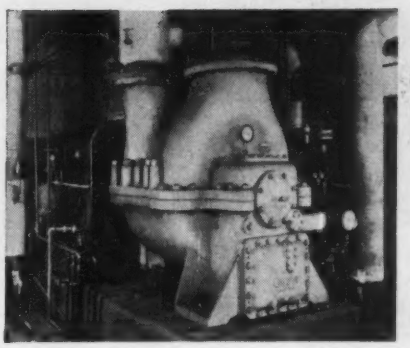
Produces clean 75% Hydrogen Gas Mixture

We can supply COMPLETE STORAGE SYSTEMS for tank car lots of anhydrous ammonia. This reduces the cost of ammonia approximately 75%. *Write for bulletin B-52*

DREVER COMPANY

RED LION ROAD & PHILMONT AVE. • BETHAYRES, PA.

Carrier Centrifugal Compressors



on the job at

The Texas Company

This Carrier Centrifugal Compressor is one of two on the job at the Casper, Wyoming, fluid catalytic cracking unit of The Texas Company. The Texas Company has installed 14 other Carrier units at five other plants.

Carrier makes a complete line of centrifugals for air and gas compression and for refrigeration—up to 10,000 hp in a single unit. There are hundreds of these dependable, efficient Carrier machines on the job at dozens of chemical plants and oil refineries across the country—serving such companies as The Atlantic Refining Company, Tennessee Eastman Company, Sinclair Oil Corporation, Wyandotte Chemicals Corporation, Esso Standard Oil Company, Dow Chemical Company. May we assist *you?*

If you'd like a copy of our informative booklet,

"Centrifugal Compressors for Industry"

please call your nearest Carrier office. Or write direct to Carrier Corporation, Syracuse, New York.

Carrier

centrifugal compressors
refrigerating equipment



This frothing unit pours liquid latex into molds.

Demineralized water helps GOODYEAR* maintain Airfoam* quality—and saves money, too!

The minerals dissolved in raw water carry electrolytic charges. If such water is used for latex dispersions, the rubber coagulates prematurely . . . causing excessive waste.

Goodyear tried distilled water . . . until increased production overtaxed the steam plant.

So Goodyear engineers looked into ion exchange. After evaluating various demineralizers, they selected Permutit resins and equipment.

Here's what they report after 4 years of continuous operation: "The Permutit units reduce dissolved solids from 165 to 3 ppm and supply iron-free water of controlled alkalinity. It has proved to be *higher in quality* than distilled water—at a considerable saving!"

Better water may solve your problem. Write to learn what Permutit can do to help you. The Permutit Company, Dept. CE-3, 330 West 42nd St., New York 36, N. Y. or Permutit Company of Canada, Ltd., 6975 Jeanne Mance St., Montreal.

**T.M.'s The Goodyear Tire & Rubber Company*

ION EXCHANGE AND WATER CONDITIONING HEADQUARTERS

PERMUTIT®

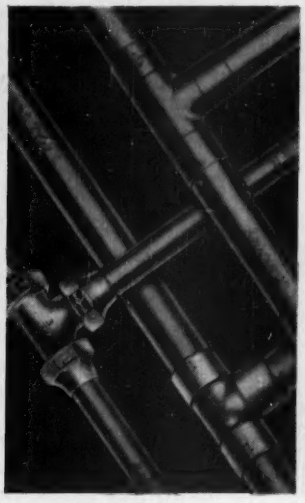
5 reasons why it costs less to install and maintain copper piping



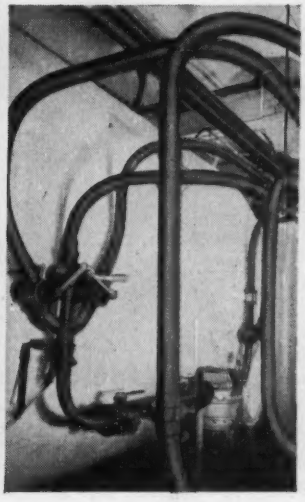
1. JOINS QUICKLY. Modern solder-type connections eliminate threading. Strong, sound, smooth-interior assemblies are made at lower cost.



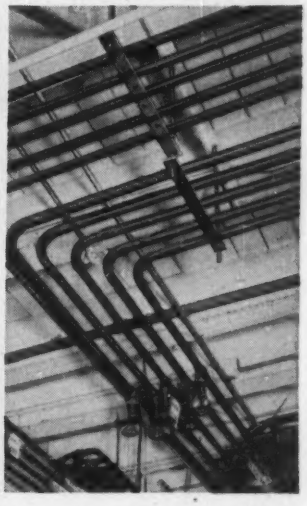
2. HANDLES EASILY. Replacement of old piping is easily and quickly accomplished with soft annealed ANACONDA Copper Tubes in coils.



3. WON'T RUST. ANACONDA Copper Tubes stay smooth and clean inside. No rusty scale can form to accumulate built-up deposits.



4. NEEDS FEWER FITTINGS. ANACONDA Copper Tubes come in long lengths. They save cutting, reduce the number of fittings needed.



5. BENDS TO CLEAR OBSTRUCTIONS. Soft-annealed ANACONDA Copper Tubes can be bent on the job to clear beams, girders, etc.

FREE BOOKLET! Publication B-1 gives more information on why it costs less to install and maintain copper piping. Write to: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.* 5445

*Pat. Applied For

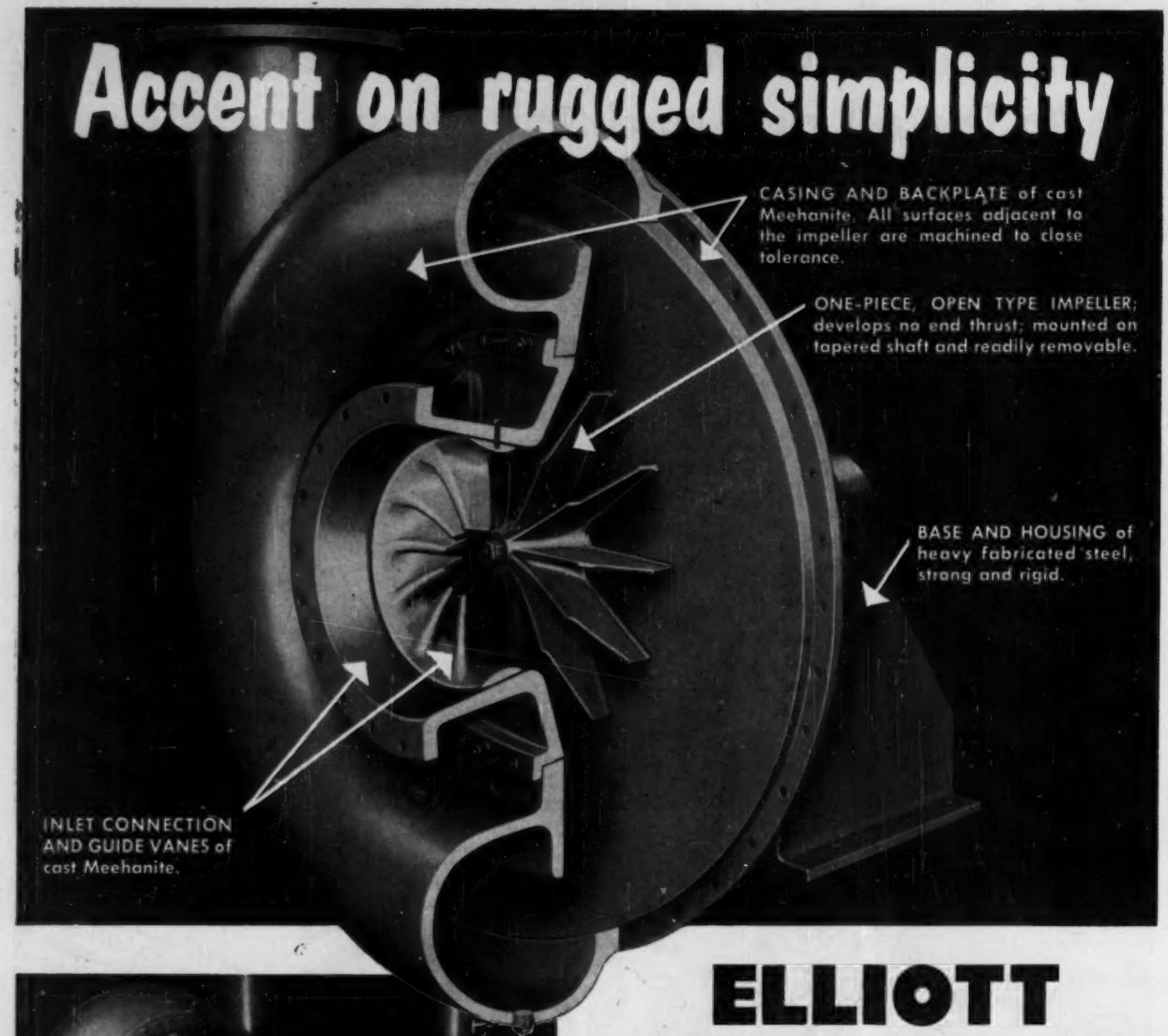
Ask your wholesaler for

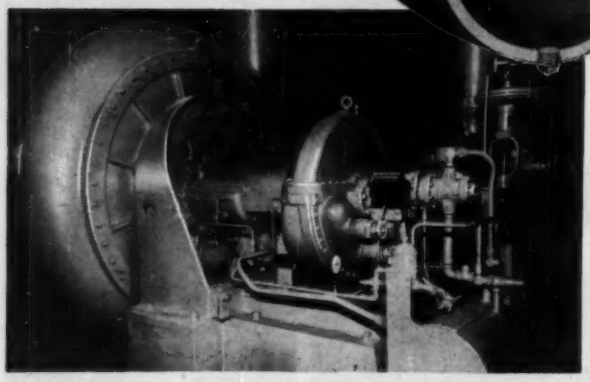
ANACONDA®

COPPER TUBES AND FITTINGS

*Also: Red Brass Pipe; PG's** (Pre-formed Panel Grids) for Radiant Panel Heating.*

Accent on rugged simplicity





Typical installation of an Elliott compressor handling 25,000 inlet cfm of air, at a discharge pressure of about 2.5 psig; driven by Elliott 300-hp steam turbine at 3300 rpm.

P4-2

ELLIOTT

CENTRIFUGAL COMPRESSORS

are extremely simple in design and construction. Hundreds are serving in processes requiring the handling and compression of large quantities of air or gas. All parts in contact with the gas to be handled can be made of suitable materials.

Elliott compressors are made in both single-stage and multistage types, for pressures up to 1000 psig, with capacities to 175,000 cfm. Elliott Company also builds the motor or turbine drive, including speed-increasing gears when required.

For details and specifications consult your local Elliott field engineer, or write Elliott Company, Centrifugal Compressor Dept., Jeannette, Pa.

ELLIOTT Company



TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS

JENKINS REGRIND-RENEW PLUG TYPE VALVES WITH

500 BRINELL *Armor Seat*



Armored against valve-killing close control of steam . . . and abrasion

Plug and seat ring are Jenkins JX500, a stainless chromium alloy steel made to Jenkins high strength specifications, heat-treated to 500 Brinell hardness. Seating surfaces are super-hard and mirror-smooth, offer highest resistance to galling, cutting, abrasion, and erosion . . . and "wire drawing" effects of close regulation of steam.

300 lb. 200 lb. 150 lb.
Globe and Angle

SOLD THROUGH LEADING DISTRIBUTORS

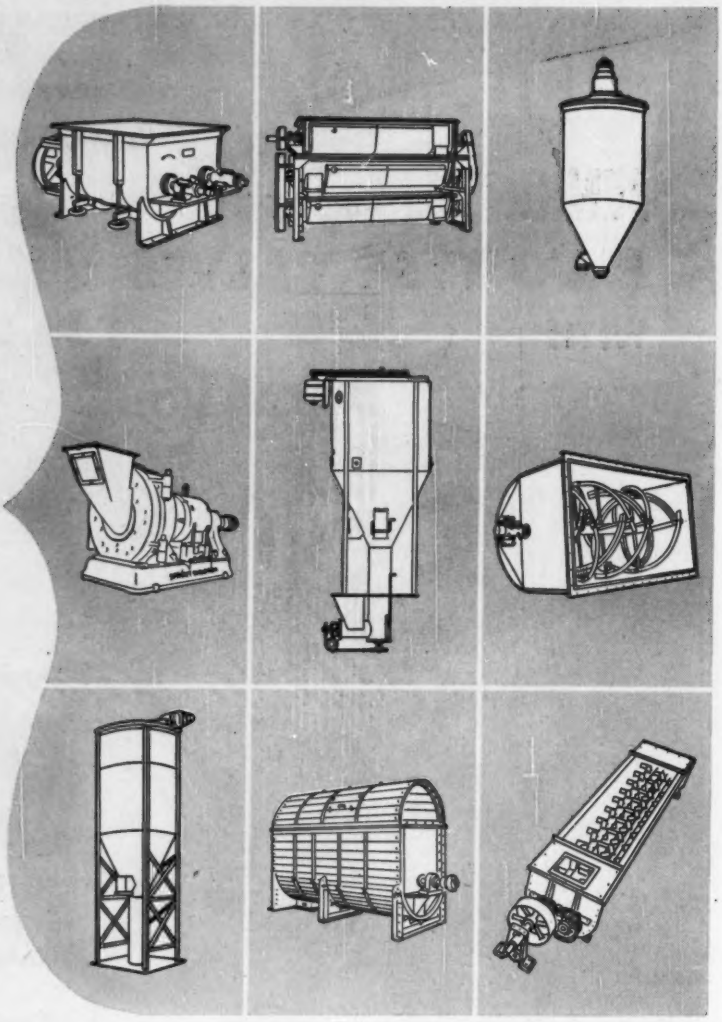
Call your Jenkins Valve Distributor, and ask for Form 202, or write: Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS VALVES SINCE 1864 TRADE JENKINS MARK

LOOK FOR THE JENKINS DIAMOND

Jenkins Bros

what's most important to you in **MIXERS**?



FLOOR SPACE?
If limited space is your problem, Sprout-Waldron may have the answer. We have mixers so compact that one with 1250 cu. ft. capacity occupies only 90 sq. ft. of floor space.

POWER?
You can save power with Sprout-Waldron mixers—verticals in sizes up to 1500 cu. ft. operate with as little as 30 h. p.

CORROSION RESISTANCE—MATERIALS CONTAMINATION?
You can get a Sprout-Waldron made of wood, stainless steel, black iron, non-ferrous or commercial alloys engineered to meet your specific needs.

SELF-CLEANING?
Sprout-Waldron verticals are naturally self-cleaning, and horizontals can be made nearly so.

MIXING TIME?
Certain Sprout-Waldron models produce complete mixes in seconds after being charged with the last ingredient.

EASE OF CHARGING?
Some Sprout-Waldron mixers are self-contained—equipped with their own loading or charging means.

DISCHARGE EFFICIENCY?
Sprout-Waldron mixers can dump entire charge in one mass with properly designed discharge gates.

INTIMATE BLENDING?
With a Sprout-Waldron blender, particles can be made to lose their individual identities.

DUST AND PRESSURE TIGHTNESS?
All Sprout-Waldron models can be made dust-tight and pressure-tight.

TEMPERATURE CONTROL?
At Sprout-Waldron there is the know-how to incorporate heating, cooling and drying with mixing.

VISCOSITY PROVISIONS?
Sprout-Waldron equipment mixes dry and semi-dry materials, adds liquids to solids, and even mixes molasses in January.

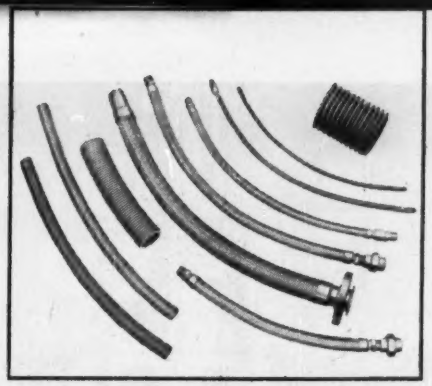
Whatever your mixing requirements, Sprout-Waldron meets them with dependable guidance, unique *"adaptioneering"* methods, a complete line of equipment, and top-notch service. You get more at Sprout-Waldron, because Sprout-Waldron has more to give. Let us advise you on your next mixer installation without cost or obligation. *Please write for details.*

YOUR INVESTMENT PROTECTED
Our 88 years of service to industry is good assurance that you can obtain parts and service for the life of your Sprout-Waldron equipment.

SPROUT-WALDRON
Manufacturing Engineers Since 1866

Equipment for SIZE REDUCTION • MIXING & BLENDING • BULK MATERIALS HANDLING • PELLETING & CUBING • PRODUCT CLASSIFICATION
Facilities for fabricating, machining, custom founding, woodworking, laboratory testing
15 LOGAN STREET • MUNCY, PA.

325



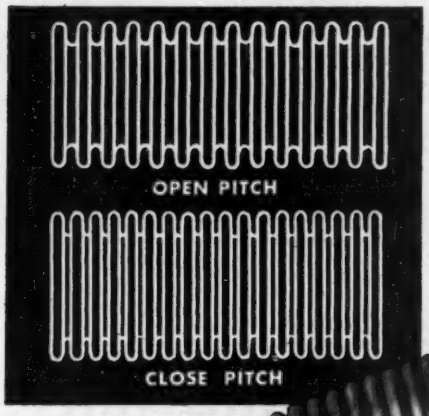
Typical American Stainless Steel Tubing and assemblies designed and manufactured for specific service conditions.

To convey high-temperature, high-pressure CORROSIVE gases and liquids...

AMERICAN'S

FLEXIBLE STAINLESS STEEL TUBING

stands up under continuous flexing
absorbs severe vibration
compensates for misalignment
is easily installed



American Flexible Stainless Steel Tubing. Cutaway section, right, shows annular construction.

American's Flexible Stainless Steel Tubing was developed to convey searching and corrosive liquids and gases under varying temperature and pressure conditions. It is available in Stainless Types 316 and 321 in sizes ¼" I.D. and up. Stainless steel wire braid covering gives added strength for high-pressure applications. American Flexible Metal Hose and Tubing is also available in bronze, aluminum, steel, monel, super-nickel, brass and other workable metals.

Complete assemblies include fittings attached by Heliarc welding or silver brazing. For help with *any* connector problem, talk it over with an American Metal Hose sales engineer. You'll save time and money when you take advantage of this specialized experience, and the design services offered by American.

58177



OPEN PITCH for general service

CLOSE PITCH for extra flexibility, frequent movement, excessive vibration

STAINLESS STEEL BRAID gives added strength for high-pressure service

ASSEMBLIES made up to your specifications complete with fittings attached

WHEREVER CONNECTORS MUST MOVE

AMERICAN FLEXIBLE METAL HOSE AND TUBING

AN ANACONDA® PRODUCT



FREE FOLDER!

Four-page folder gives engineering data on construction and types. Includes pressure ranges, bending diameters, weights, data on fittings.

Write *today* for your copy. *Please print.*

CE

The American Brass Company, American Metal Hose Branch, Waterbury 20, Connnecticut.

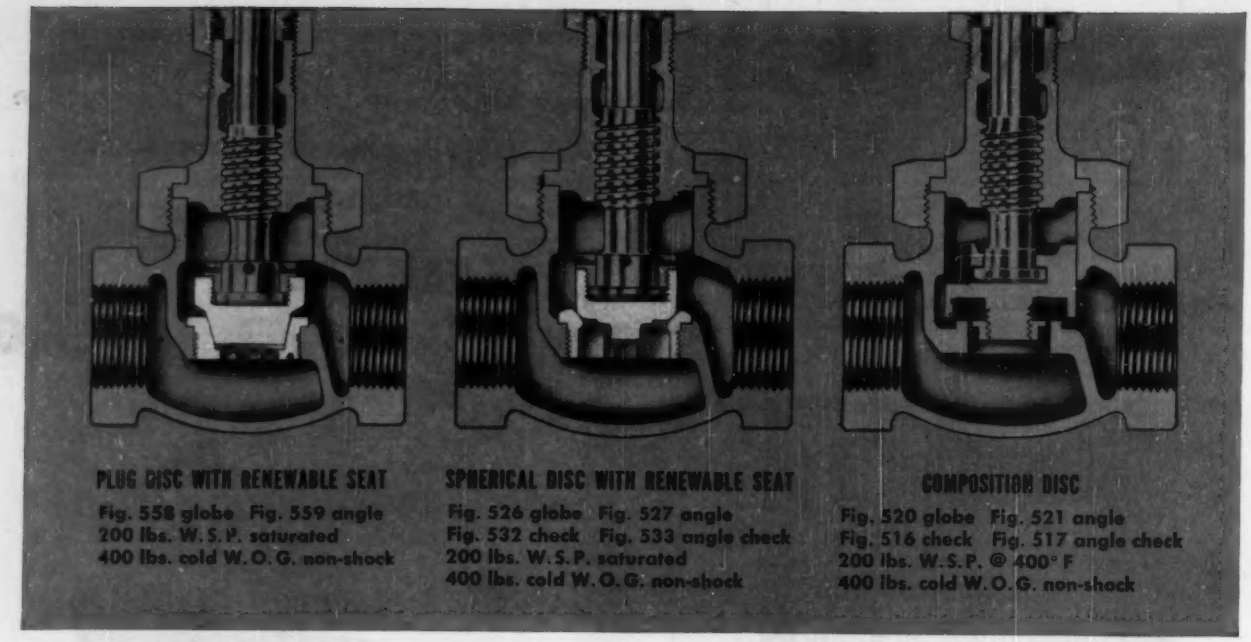
Please send me a copy of Bulletin STC-1, "Flexible Stainless Steel Tubing by American."

NAME.....

COMPANY.....

STREET.....

CITY.....ZONE.....STATE.....



PLUG DISC WITH RENEWABLE SEAT
Fig. 558 globe Fig. 559 angle
200 lbs. W.S.P. saturated
400 lbs. cold W.O.G. non-shock

SPHERICAL DISC WITH RENEWABLE SEAT
Fig. 526 globe Fig. 527 angle
Fig. 532 check Fig. 533 angle check
200 lbs. W.S.P. saturated
400 lbs. cold W.O.G. non-shock

COMPOSITION DISC
Fig. 520 globe Fig. 521 angle
Fig. 516 check Fig. 517 angle check
200 lbs. W.S.P. @ 400° F
400 lbs. cold W.O.G. non-shock

Choose the OIC disc-seat combination of greatest reliability

The modern OIC "500 Line" provides a choice of 3 bronze globe valve designs to meet specific sets of operating conditions.

You can rely on all three. But you will improve over-all globe valve performance by selecting the design which especially fits your particular operating requirements.

Base your selection on these facts

Plug disc with renewable seat—Use where throttling is required on services up to 550°F. Tapered disc and seat are stainless steel, hardened to 500 Brinell. They resist erosive and abrasive wear resulting from throttling . . . even crush foreign particles to effect tight closure without damage to seating surfaces. Seat and disc may be reground or replaced.

Spherical disc with renewable seat—Use in general wide-open and closed service, up to 550°F, where frequent cycles of operation will be required. Seat and disc are copper-nickel alloy, resistant to corrosion and galling. Disc and seat mate by line contact assuring positive tight closure on any fluids. Both seat and disc may be reground or replaced.

Composition disc—Normally furnished with 8E disc—suitable for steam, hot water, oil and gas—designed for use in wide open or closed position. This relatively soft disc material permits disc to effect tight closure in spite of small scratches or particles on the seat. This valve may be used for a number of services by fitting it with discs suitable for the fluids to be handled. Use of slip-on type disc-holders simplifies disc replacement.

Stems on all "500 Line" valves are machined from special OIC 40-alloy which will not gall or seize. The complete "500 Line" includes bronze globe, angle and check valves, with many parts interchangeable.

For choice of design, high quality and maximum performance specify the complete "500 Line" when you order from your OIC Distributor.

Write for Form No. 1001 which describes the "500 Line" more fully.

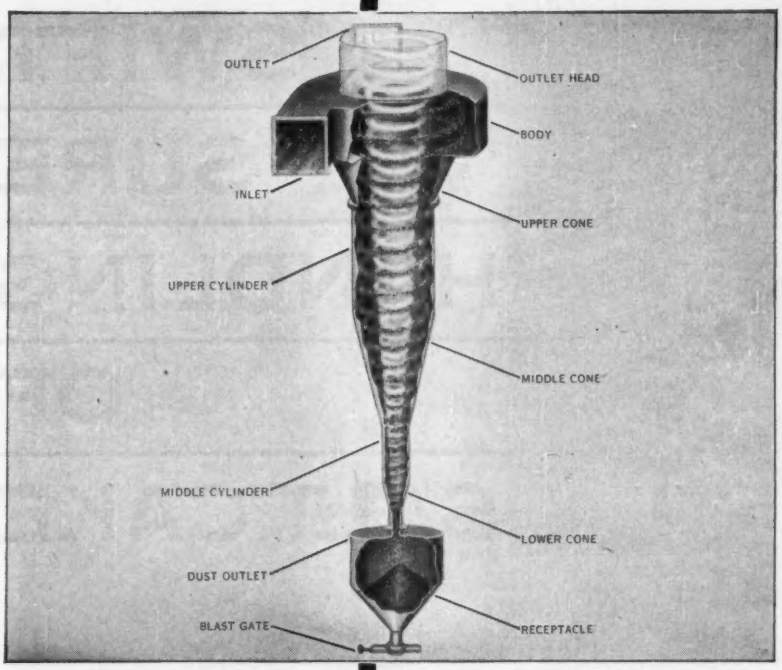
OIC
FOUNDED 19[illegible]3

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**

American Blower Dust Collectors

Recover valuable materials, eliminate nuisances



Mechanical type collectors offer high efficiencies over wide range

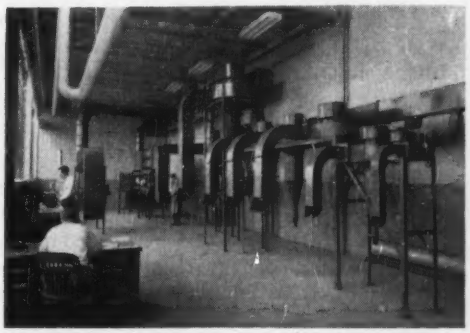
Simplicity in principle and design is the key to the efficient operation of American Blower Type D Dust Collectors. There are no rotating parts to adjust or repair. No water, oil or other collecting substances, which might cause corrosion or plugging, are used.

As a result, American Blower high-velocity mechanical collectors are widely used in industry as a means of eliminating a dust nuisance or to recover valuable materials from air.

If you have a problem in dust collection, consult the nearest American Blower Branch Office, or write stating your requirements.

Complete dust laboratory to serve you

Technical information, obtained from thousands of tests in our laboratory and in the field, has provided our engineers with an extensive file on dust problems and covers thousands of dust samples. Engineers are invited to make use of our complete dust-research laboratory where tests can be made on commercial-sized collectors.

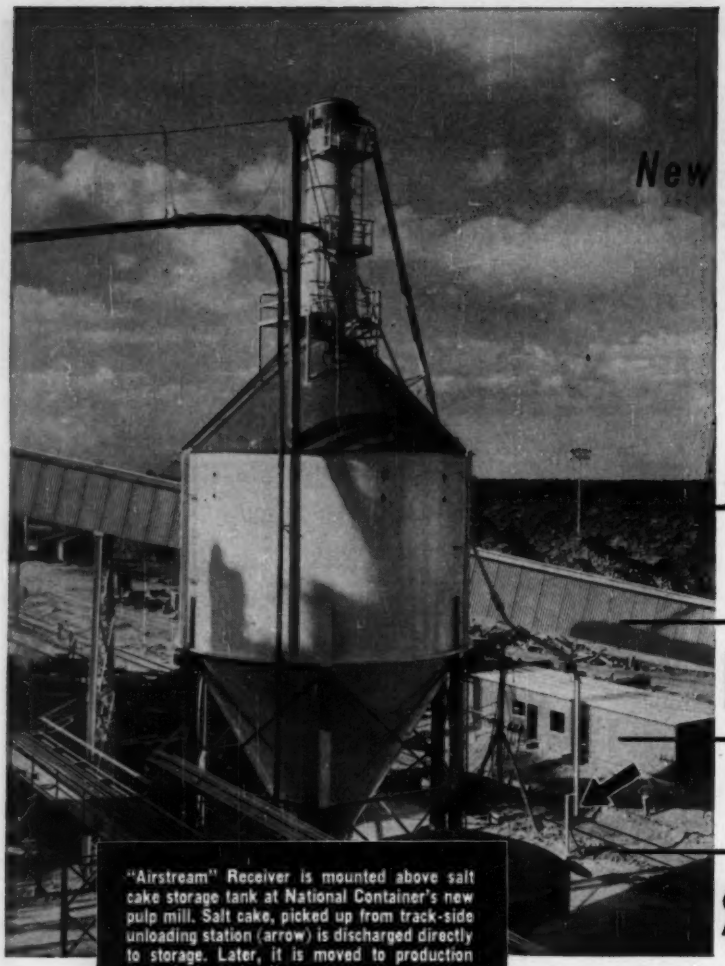


BUILDING *THROUGH BUSINESS* FOR A BETTER AMERICA! *support Junior Achievement*

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE
DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS



"Airstream" Receiver is mounted above salt cake storage tank at National Container's new pulp mill. Salt cake, picked up from track-side unloading station (arrow) is discharged directly to storage. Later, it is moved to production through conveying line suspended from wires.

New National Container Plant Relies on Dracco Airstream for:

SWIFT SURE HANDLING OF SALT CAKE

Dracco's "Airstream" Conveying method is preferred again!

This time, "Airstream" has been put to work handling salt cake at National Container Corporation's new plant in Valdosta, Georgia. Large tonnages of salt cake (or sodium sulfate) are consumed daily at National's plant to make up the cooking liquors necessary for producing wood pulp.

The Dracco system performs two vital materials handling jobs—unloading to storage and transporting to process. Incoming box cars are emptied by one man from a track-side unloading station. All salt cake is moved directly to a 90-foot storage tank at 15 tons per hour without loss or contamination.

For daily production requirements, this versatile Dracco installation also withdraws salt cake from storage and conveys it some 175 feet to a nearby plant. There, the salt cake is discharged directly to process tanks.

Highly automatic, this efficient handling system assures minimum labor costs and permits economical bulk purchasing. Designed and engineered by Dracco, it provides completely dependable, low-cost materials handling for National Container.

If your handling problem involves bulk granular or powdered materials, don't overlook the economy of an "Airstream" Conveyor. Write to:

DRACCO CORPORATION
4040 East 116th Street • Cleveland 5, Ohio

The economies and advantages of the Dracco "Airstream" method are presented in Bulletin 529. A copy will be sent you on request.

DRACCO *Performance Proved*

Airstream **CONVEYORS • DUST CONTROL EQUIPMENT**

How to get maximum tube life per dollar: Ask the experts!

This month's report is on:

SICROMO 7

Suggested as a substitute for steels of the 5.0 per cent chromium type for applications which require increased resistance to corrosion by hot petroleum products.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

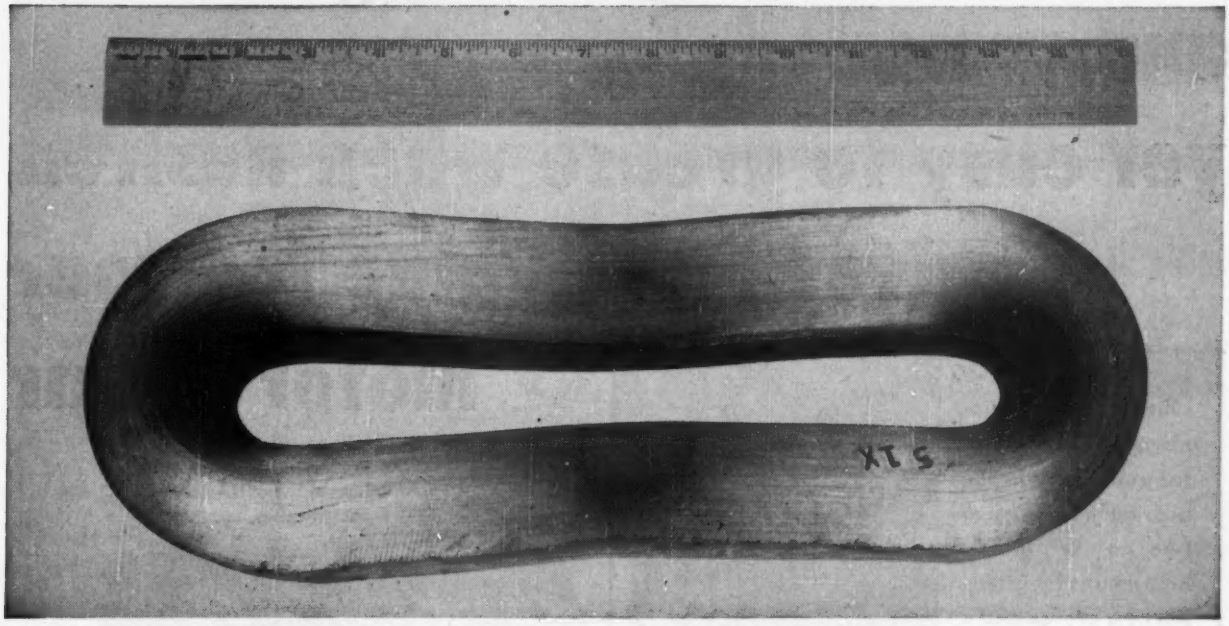
Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

** Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

YOUR temperature, pressure, corrosion and oxidation problems may be solved by serveral analyses of high temperature steels. But from the standpoint of maximum tube life per dollar—the best life/cost ratio—there's only *one* analysis that's best for you.

To get that one analysis, go to metallurgists of The Timken Roller Bearing Company. They're recognized authorities on high temperature steels—with more than 20 years of steel research and experience behind them. They'll help you choose the one tube steel analysis that's best for your application from the 24 different analyses at their disposal. And no matter which one you choose, you can be assured of uniform quality because the Timken Company rigidly controls quality from melt shop through final tube inspection.

Let our "RSQ"—Research, Supply, Quality—solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Flattened test of 10½" O.D. by 1.580" wall of 18-8 Cb showing the excellent ductility of large, heavy-wall Timken seamless tubing.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



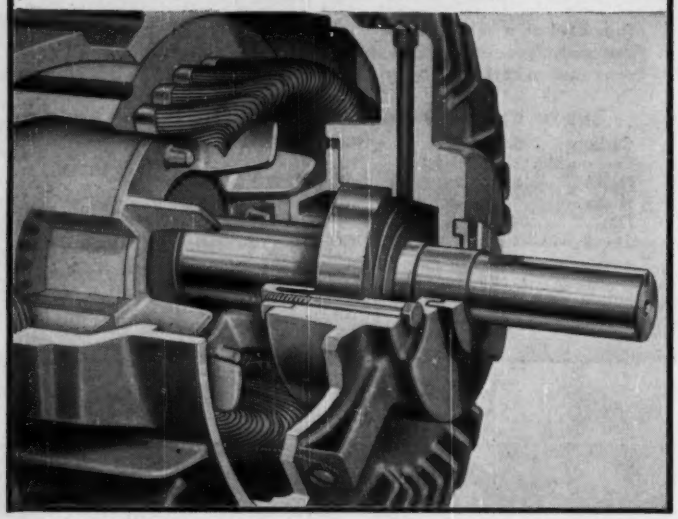
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

ALLIS-CHALMERS
Totally-Enclosed
Fan-Cooled
MOTORS

This Bearing, fully enclosed and protected, yet easy to grease when desired ...gives more value for your motor dollar

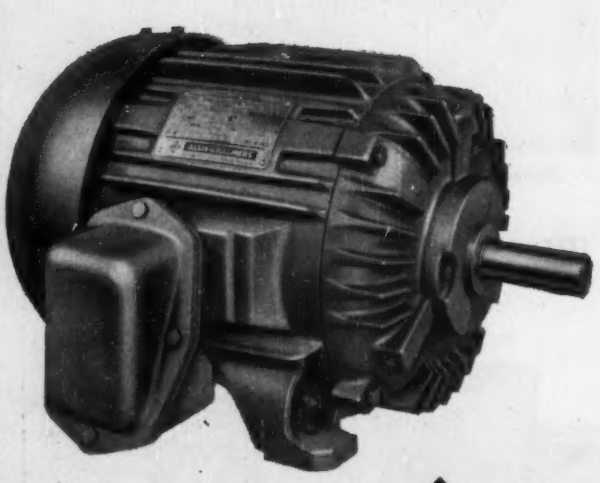
The bearing cap is held tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.



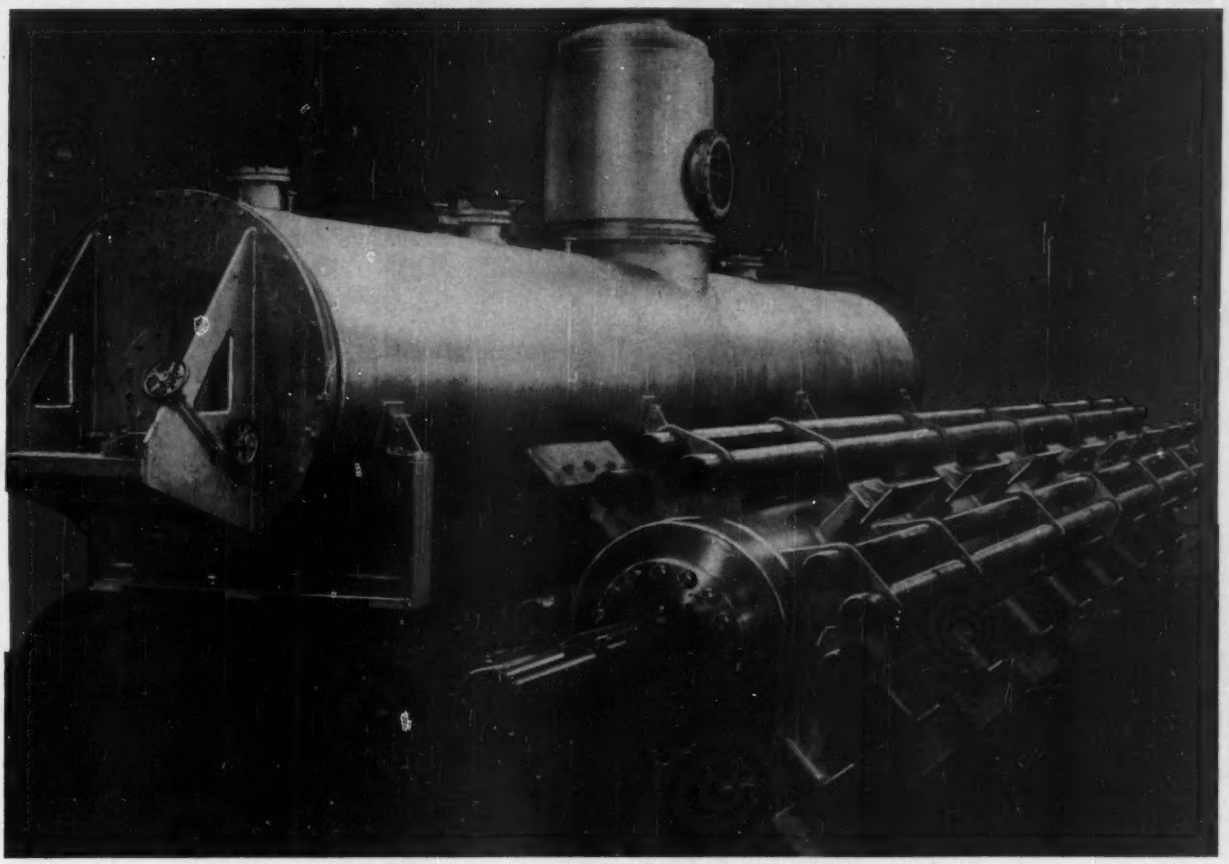
Lubricate without dismantling motor. Pipe-tapped holes in the bearing housings at two points provide both means for inserting new grease and a means of flushing out old grease.





Look for the extra bolts on the end housing... the sign of greater value. Ask your Allis-Chalmers representative or Authorized Distributor to show you a cutaway section of this maintenance-cutting design. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7225.

ALLIS-CHALMERS A-4575



Buflovak Vacuum Rotary Dryer—with revolving heating tubes and heated agitator arms shown separately

Buflovak Vacuum Rotary Dryers provide low temperature drying with agitation . . . and recovery of solvents

When you need a vacuum rotary dryer, you may readily find that a *Buflovak* conventional type is just right for your production requirements.

Built in a wide range of sizes, this dryer consists of a jacketed cylinder, heated by steam or hot water—charge and discharge openings—and a revolving agitator that accelerates both the drying and the discharging of the dry material. Mounted on the agitator shaft are straight or helical-faced blades, which thoroughly mix the material with a shearing action that reduces power consumption. When desired, other features may be furnished to give these standard *Buflovak* Vacuum Rotary Dryers a wide range of applications.

If your needs require special equipment, our engineers have the practical experience and technical know-how to design and build dryers for any special application. One example is special agitators for breaking up materials that form lumps, thereby reducing them to a uniform powder during drying operation.

In addition, you have the advantages of the complete facilities of the *Buflovak* Research and Testing Laboratory. This includes a pilot test plant which is used for pre-testing both processes and products. It's your assurance that the equipment you buy will meet your requirements.

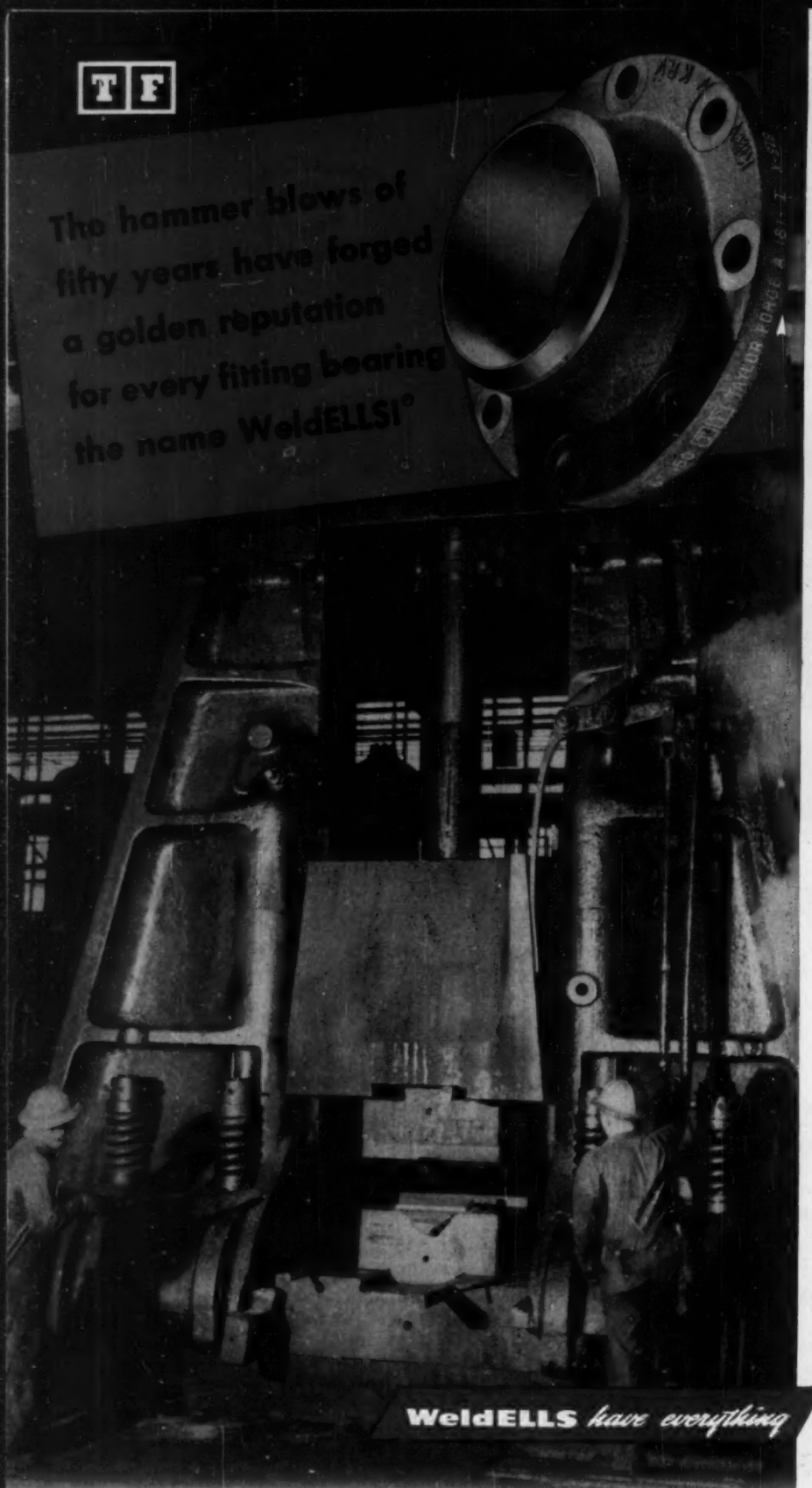
These services are readily available to help you solve your drying problems.

Write for Catalog 341 to get complete information about Buflovak *Rotary Dryers.*

BLAW-KNOX COMPANY
BUFLOVAK EQUIPMENT DIVISION
1551 Fillmore Avenue, Buffalo 11, New York

BLAW-KNOX

BUFLOVAK PRODUCTS: evaporators • dryers (atmospheric and vacuum) • solvent recovery and distillation equipment • chemical plant equipment • food processing equipment • kettles • fabricated processing equipment • vulcanizers . . . plus a complete Pilot Plant for pre-testing processes and products.





Both hammers were the largest of their time

These two forging hammers went into service some 40 years apart, yet they boast the same claim to distinction: both were the largest in the world when they went to work for Taylor Forge. The hammer above was largest in the world of 1910. The hammer at the left is largest of its type in operation in the world of *today!*

The old hammer, now extensively rebuilt, is on well-earned semi-retirement in our Chicago plant; but it still stands as a symbol of the vigorous pioneering spirit that gave industry its first forged steel flanges on a commercial scale. It helped to forge out the first lap joint flanges for Van Stone joints. It saw the first engineered slip-on flanges; the first welding-neck flanges; the first forged welding necks and pressure-vessel nozzles; the first complete line of seamless, butt-welding fittings.

Since it struck its first blow other Taylor Forge hammers have been successively the world's largest, but "Old Number One" saw all the steps that made Taylor Forge the leader in designed piping progress.

Today's world's largest hammer in the Taylor Forge Gary Plant is eloquent proof that Taylor Forge is *still* setting the pace!

An episode in the story of Taylor Forge leadership in designed piping

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

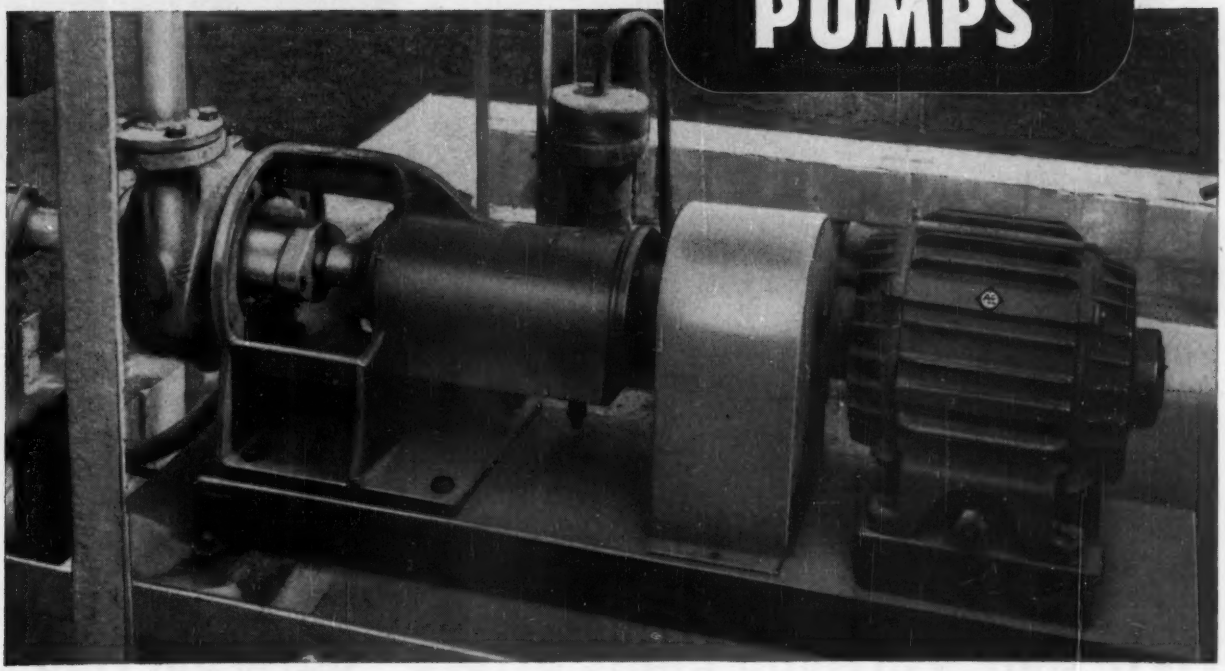
TAYLOR FORGE & PIPE WORKS • General Offices and Works: P.O. Box 485, Chicago 90, Illinois
Offices in all principal cities • Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada

Save Hundreds of Dollars

on Many Process Pump Applications

ALLIS-CHALMERS

CHEMICAL PUMPS



This pump will do many of the jobs of a costly refinery-type pump, yet it costs hundreds of dollars less to buy.

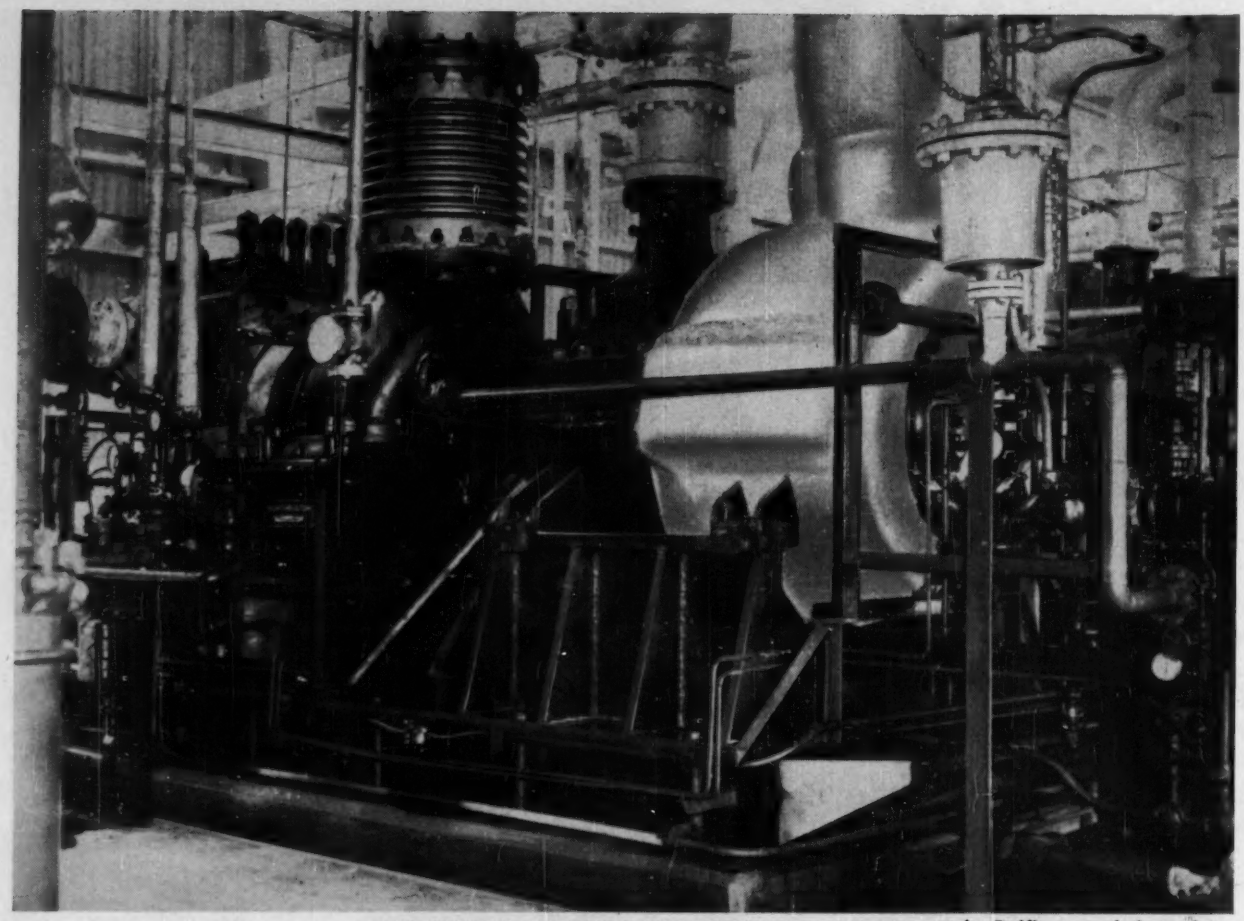
It isn't meant to do every job in the chemical industry. But it will handle a big percentage of the jobs. Check the construction and design features that make this possible:

- It's built in most used ratings . . . to 3500 gpm, heads up to 550 ft.
- Handles liquids in most common temperature range . . . up to 550 F.
- Pumps liquors, corrosive materials and solutions, and petroleum products.
- Built in wide choice of materials including: iron, bronze, aluminum bronze, stainless steel, high nickel alloys and others.
- Available with several sealing methods including standard packing, inside and outside mechanical seals, plus special features such as cooling water jacket, smothering gland and others.
- Features double-row, oil-lubricated bearings. Two oil rings running in generous reservoir of oil carry oil to bearings.
- Rigid cast-iron frame supports pump body and holds bearings in alignment.

Get complete information. Call your nearby Allis-Chalmers district office. Or write to Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 52B7638.

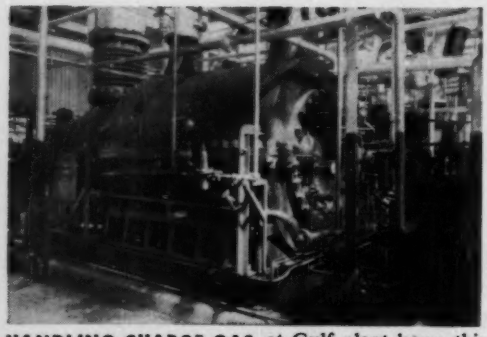
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ALLIS-CHALMERS



WORTHINGTON CENTRIFUGAL REFRIGERATION COMPRESSOR in Gulf's new ethylene plant. Nozzles are for interstage bleed which boost discharge flow to four times initial suction flow.

New Gulf ethylene plant offers "curb service"



HANDLING CHARGE GAS at Gulf plant keeps this Worthington centrifugal compressor busy. Water injection nozzles control temperature, prevent co-polymerization.

Gulf Oil's new 180 million pound-per-year ethylene plant at Port Arthur, Texas, is the first ever designed to deliver its products directly to consumers—some of them 80 miles away—*by pipe line!*

It's also the first to use centrifugal compressors (by Worthington) for charge gas compression, water injection for cooling to prevent co-polymerization and multi-nozzle compressors to accommodate large bleed-in loads.

Three Worthington compressors handle five different charge streams in the process. Two more provide the necessary refrigeration for the process. Power—19,850 hp in all—comes from five Worthington steam turbines and one gas expander.

For over 50 years Worthington has been helping petroleum and chemical processing men with knotty refrigeration problems. Check your Worthington district office about yours—or write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.5.30, Harrison, N. J.

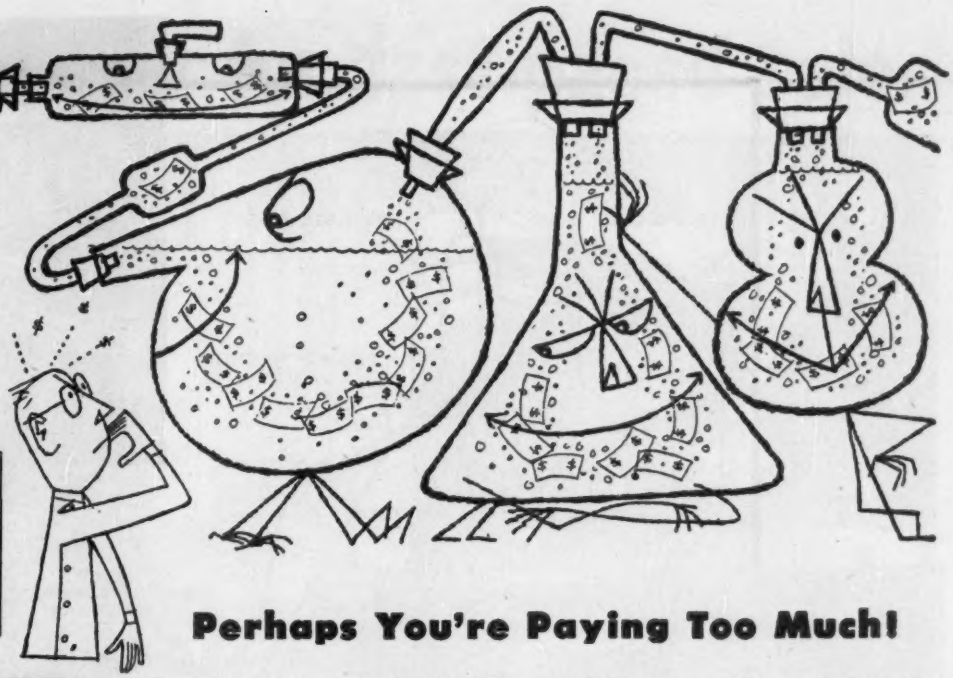
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"SEE the Worthington Corporation Exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 41st Street."

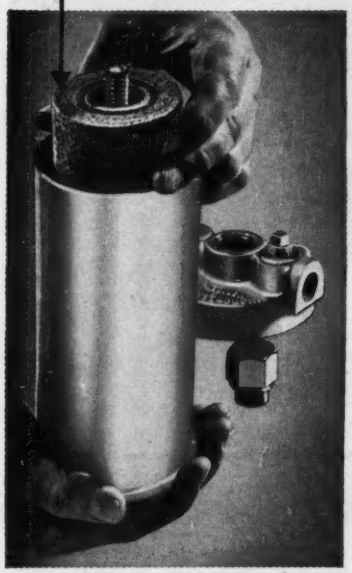
WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

HOW MUCH IS IT WORTH TO YOU... TO GET PROCESS FLUIDS CLEAN?







*10, 25, 50 micron densities available
MICRO-KLEAN cartridges fit other makes; special lengths available for built-in installations.

Perhaps You're Paying Too Much!

Sometimes, it's worth a *lot*. You'll go to any expense to remove contamination.

But—in hundreds of cases, chemical firms are getting perfectly satisfactory results with the less expensive Cuno MICRO-KLEAN replaceable-cartridge filter.

SO YOU HAVE TO ASK YOURSELF . . .

1. *Will the* MICRO-KLEAN *do my job well enough?*

To help you answer: Cuno MICRO-KLEAN is guaranteed to remove all solids larger than specified* plus a large proportion down to 1 micron.

2. How much will the MICRO-KLEAN save me?

Well, the savings come from:

a. Lower initial cost
b. Lower maintenance cost—housing easily disassembled for cleaning—filter renewed by simple replacement of cartridges.
c. Lower replacement cost—MICRO-KLEAN's exclusive construction assures double life.
d. Positive mechanical separation—cartridge cannot shrink, swell, channel, or distort—fluid is protected.

INVESTIGATE MICRO-KLEAN NOW!
This well-proved filter handles wide ranges of fluids at wide ranges of flow rates and viscosities . . . capacities from a few to over 800 gpm . . . connections from ⅜ in. IPS to 6 in. flanged.

CUNO

Complete Line
ENGINEERED FILTRATION
If you can pump it, Cuno can filter it

MICRONIC (Micro-Klean) • DISC-TYPE (Auto-Klean) • WIRE-WOUND (Flo-Klean)

WHAT'S YOUR CLEANING PROBLEM? SEE IF MICRO-KLEAN WON'T SOLVE IT FOR A FRACTION OF THE COST

- ☐ Absorption oils
- ☐ Cellulose acetate
- ☐ Chlorinated solvents
- ☐ Coal tar solvents
- ☐ Enamels
- ☐ Ethylene glycol
- ☐ Ethyl and methyl cellulose
- ☐ Glacial acetic acid
- ☐ Helium
- ☐ Industrial alcohols
- ☐ Lacquers
- ☐ Natural gas
- ☐ Nitrogen
- ☐ Paraffin
- ☐ Petroleum solvents
- ☐ Photographic developing solutions
- ☐ Pickling brines
- ☐ Sulphuric acid (up to 12%)
- ☐ Varnishes
- ☐ Water and water solutions

OTHERS .....

PLEASE ATTACH COUPON TO YOUR BUSINESS LETTERHEAD

CUNO ENGINEERING CORPORATION Dept. 162
102 South Vine Street, Meriden, Conn.

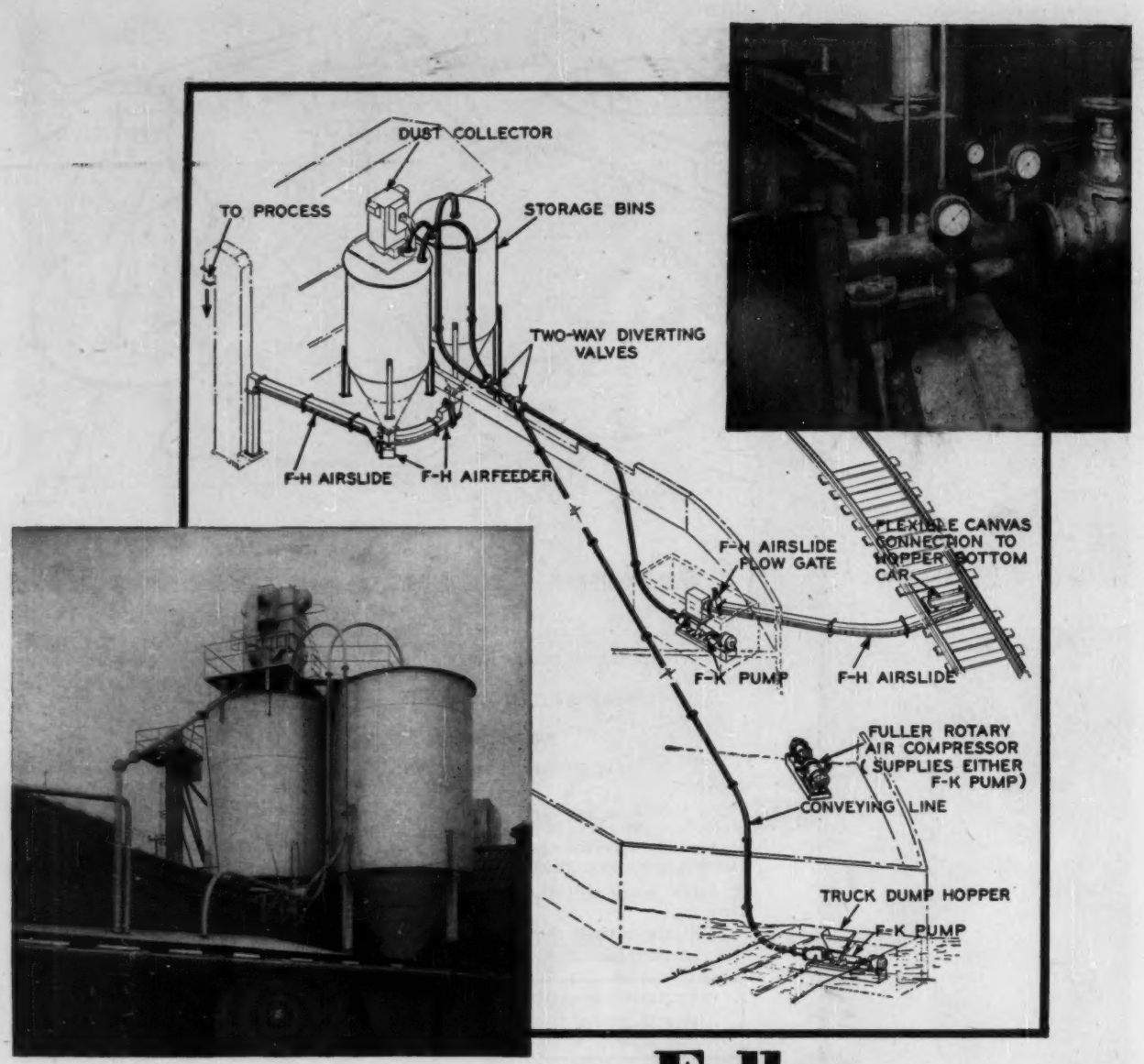
Please send me a free copy of your MICRO-KLEAN bulletin. I am especially interested in the services checked.

Name.....Title.....

Company.....

Address.....

City.....State.....



Certain-teed makes certain with **Fuller**

... Unloading and conveying system pays off

A few years ago, Certain-teed Products Corporation decided to find, if possible, more economical methods of operation in its York, Pa. plant. One problem given serious consideration was the handling of incoming limestone and slate filler dust received in bags, requiring costly, manual labor, resulting in breakage of bags with consequent loss of material and a dusty condition in the plant.

Together, Certain-teed and Fuller engineers made studies of their layout and came up with a solution—a combination of the Fuller-Kinyon Conveying System and F-H Airslides.

Two Fuller-Kinyon Pumps are used. One conveys limestone dust from hopper-bottom cars, utilizing the Airslide to convey from cars to the pump located in a pit in the plant. This pump conveys to either one of the two storage bins . . . efficient, clean, rapid transfer from cars to storage. The other pump handles the slate dust, delivered in trucks, also conveying to storage. Withdrawal of either material from storage bins is accomplished with Airslides, which discharge to an elevator delivering to process.

Air for the pumps is supplied by a Fuller Rotary Single-stage Compressor, having a capacity of 482 c.f.m. at 20-lb. pressure. Low-pressure air, for the Airslides, is supplied by a small blower.

It is reported that the savings realized by the use of this Fuller system has paid for the installation in less than two years of operation.

Possibly your materials handling is antiquated and costly, which could be remedied by a comparatively small investment. Why not find out . . . have a Fuller engineer study your operation and submit a report . . . it will cost you nothing, nor obligate you in any way.

FULLER COMPANY
Catasauqua, Pa.

Branch offices: Chicago—San Francisco—Los Angeles—Seattle—Birmingham

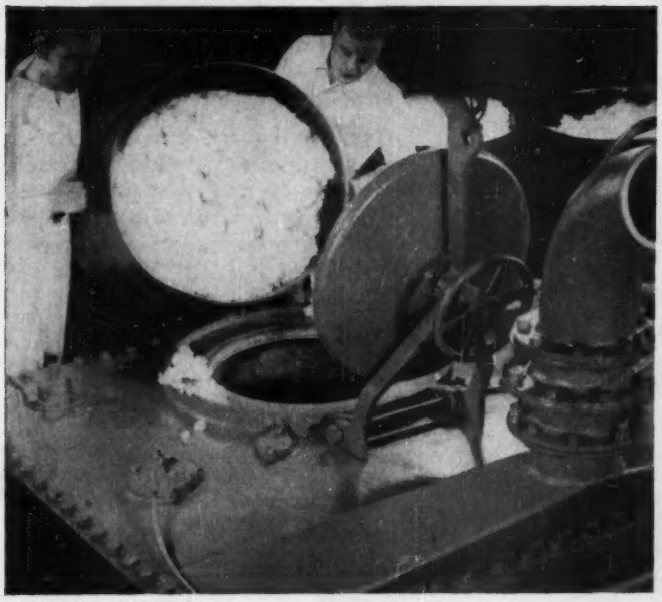
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DRY MATERIAL CONVEYING SYSTEMS AND COOLERS . . . . PREHEATERS . . . . COMPRESSORS AND VACUUM PUMPS . . . . FEEDERS

specify Enjay for fast-paced sales



IN PETROLEUM (*Motor Oil and Gasoline Additives*)



IN CHEMICALS (*Plastics*)



IN SURFACE COATINGS (*Paint and Varnish*)

PETROLEUM	SURFACE COATING	CHEMICAL
PARANOX	PETROHOL 91	PETROHOL 91
PARATONE	PETROHOL 95	PETROHOL 95
PARAFLOW	PETROHOL 99	PETROHOL 99
PARAPOID	JAYSOL	JAYSOL
PARADYNE	Secondary Butyl Alcohol	Iso-Octyl Alcohol
PARATAC	Secondary Butyl Acetate	Decyl Alcohol
PETROHOL	Isopropyl Acetate	Denatured Ethyl Alcohol
Methyl Ethyl Ketone	Acetone	Tridecyl Alcohol
Dewaxing Aid	Methyl Ethyl Ketone	Dicyclopentadiene
Ethyl Ether	Dicyclopentadiene	Isoprene
Isopropyl Ether	Ethyl Ether	Butadiene
Reference Fuels	Isopropyl Ether	Ethyl Ether
	Naphthenic Acids	Isopropyl Ether
	Iso-Octyl Alcohol	Tetrapropylene
	Decyl Alcohol	Tripropylene
	Denatured Ethyl Alcohol	Aromatic Tars
		Benzene
		Acetone
		Methyl Ethyl Ketone

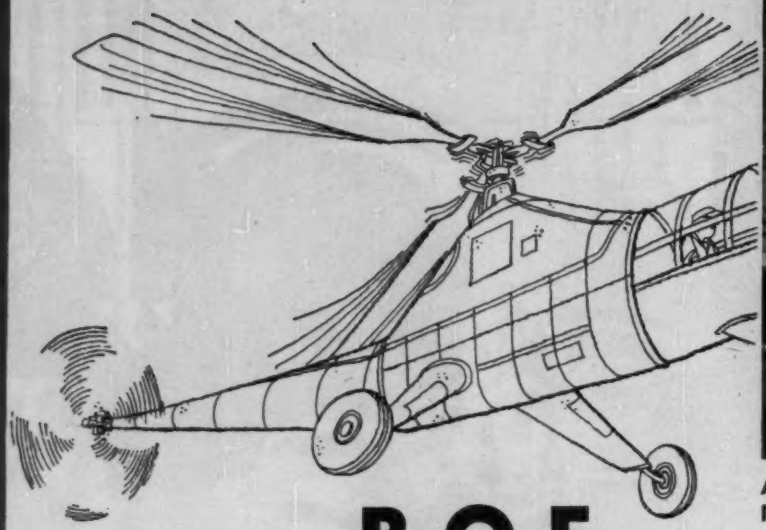
Rely on Enjay for top quality in your product, the kind that makes for growing demand and fast-paced selling. The Enjay Company supplies the petroleum, surface coating and chemical industries with a complete line of uniform, high quality petroleum chemicals backed by 35 years of *proved* results. You can also depend on Enjay for leadership in research and for expert technical assistance in developing new or improved products through chemistry. *Next* time, call Enjay for your chemical needs.

ENJAY

35 successful years of leadership in serving industry

Enjay Company, Inc. · 15 West 51st St., New York 19, N.Y.

Capsule Case History:



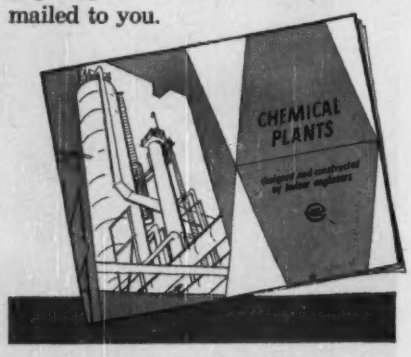
B.O.F.

***B**uilt-in **O**perational **F**lexibility (outstanding characteristic of the helicopter) is an "extra" found in every plant designed and built by Kaiser Engineers. Not hidebound by tradition, the fresh approach of the KE team of specialists assures you that your next plant will feature efficient and flexible operation at low cost.*



A Basic Process Change was required for an alumina producer when bauxite from Jamaica was added to the established source of Surinam bauxite. Differing chemical characteristics of the ore were minimized by the design which enabled the enlarged plant to process *either* bauxite, alone or in any combination of the two. A Kaiser Engineers plus is design of process or plant with operational flexibility built in.

On your request, a copy of Kaiser Engineers new chemical processing brochure (No. 101), as well as a 32-page experience record book, will be mailed to you.



kaiser engineers...*for low operating costs*

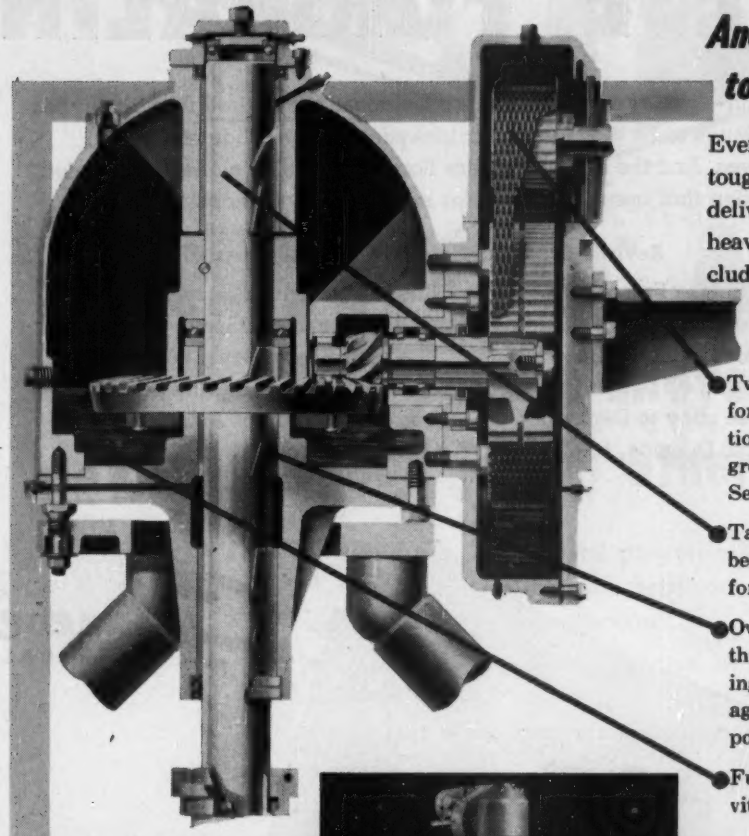
DIVISION OF HENRY J. KAISER COMPANY

ENGINEERS K CONTRACTORS

• HOME OFFICE: KAISER BUILDING, OAKLAND 12, CALIFORNIA (CABLE: KAISENGS) NEW YORK, PITTSBURGH, LOS ANGELES, WASHINGTON, D. C.
• HENRY J. KAISER CONSTRUCTION CO. • HENRY J. KAISER COMPANY (Canada) LTD., MONTREAL

Glascote reactors give you drives that

excel in heavy-duty operation



Another good reason why it pays to do business with Glascote

Every unit in Glascote's complete line of tough, precision-engineered drives is built to deliver remarkable dependability in your heavy-duty applications. These drives include V-belt types for laboratory reactors . . . variable-speed and gear-head motor drives.

- Two drive reductions transmit ample power for all agitator needs and speeds. First reduction is accomplished by hardened, precision-ground, spiral-bevel pinion and ring gears. Second is made by silent chain or helical gear.
- Tapered roller bearing and a radial roller bearing assure friction-free straddle-mounting for pinion shaft.
- Oversize vertical sleeve bushing and ball thrust bearing support the ring gear, mounting and agitator shaft. Positive alignment for agitator shaft assured by bushings at three points.
- Full bath lubrication means long life for all vital parts.



Equipped with dependable drives, Glascote reactors are available in a selection of sizes for laboratory, pilot plant and production applications. Your choice of glass-lined or alloy metals.

Ask the representative who calls on you for all the facts about Glascote products—reactors, receivers, condensers, evaporators, storage tanks and accessory products. Or, if you prefer, write direct. Glascote Products, Inc., Cleveland, 17, a subsidiary of A. O. Smith.

Glascote

PRODUCTS, INC.

CLEVELAND 17, OHIO

Sales offices or agents in Principal Cities

Export Sales:
A. O. Smith Corp., International Division, Milwaukee 1, Wisconsin

A subsidiary of A.O.Smith Corporation

World's largest manufacturer of glass-lined steel products



formaldehyde isn't "formaldehyde" any more...

For low solids resins it's

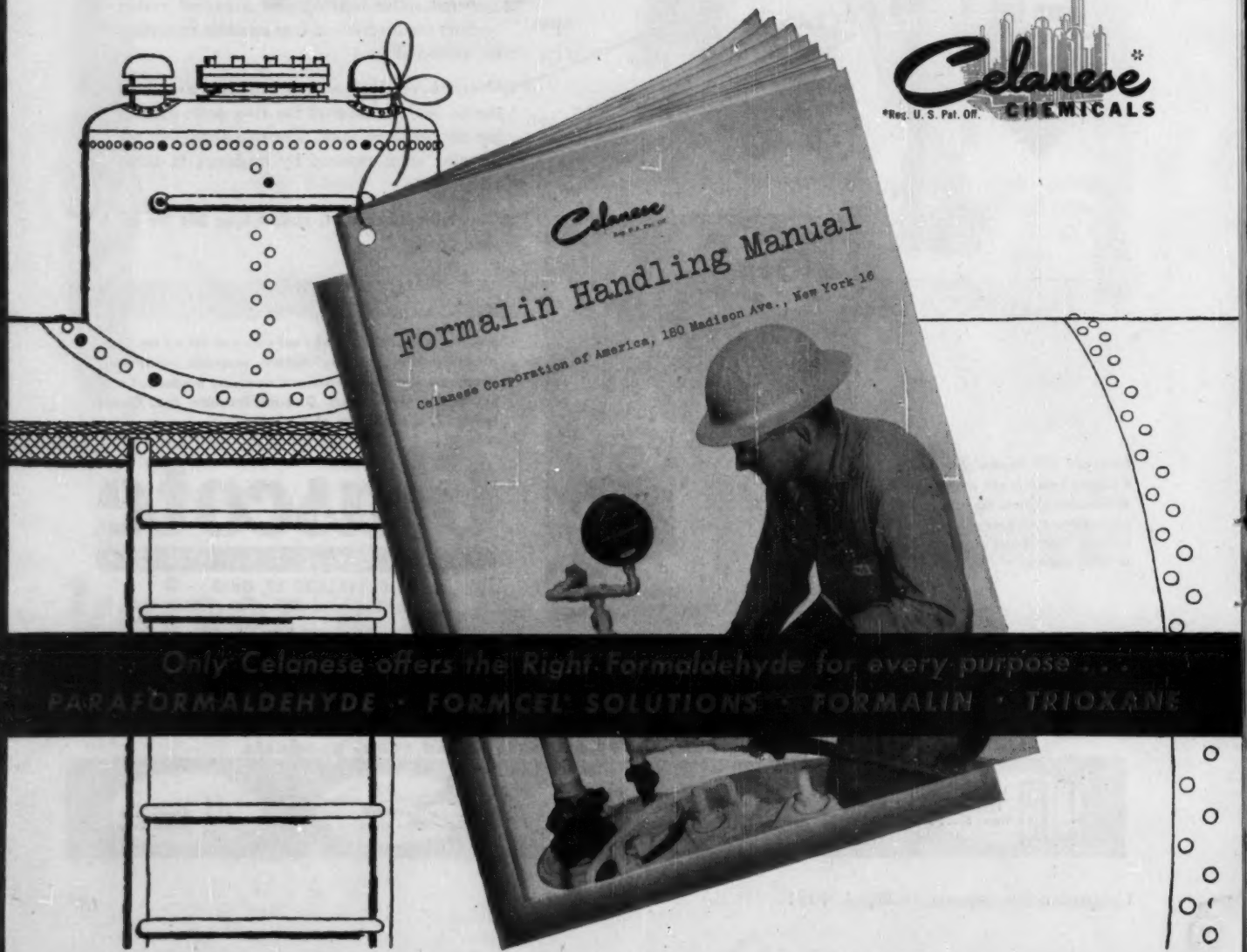
CELANESE* FORMALIN

Formalin—one of the hard-working Celanese specialized formaldehydes—continues to be the right formaldehyde for low solids resins and adhesives. And the right source for Formalin is still Celanese integrated production that assures continuous supplies for all industries.

Revised Edition of Celanese Formalin Manual

The Celanese Formalin Handling Manual is a valuable reference for technical and non-technical personnel. Clear and concise, it covers storage, handling, analysis methods, safety precautions, temperature effects, and all other vital information for users of Formalin. Send for your free copy to Dept. 553-C Celanese Corporation of America, Chemical Division, 180 Madison Avenue, New York 16, N. Y.

Celanese*
*Reg. U. S. Pat. Off. CHEMICALS



Only Celanese offers the Right Formaldehyde for every purpose . . .
PARAFORMALDEHYDE · FORMCEL SOLUTIONS · FORMALIN · TRIOXANE

AMPCO®

Producers of... "The Metal Without an Equal"

AMPCO* METAL

...the special alloys that make good where other metals fail

HERE are some of the properties of Ampco Metal that help you keep production up, costs down:

- **Excellent resistance to corrosion in certain media.**
- **High tensile and compressive strength.**
- **Unusual resistance to wear from abrasion, erosion, and cavitation pitting.**
- **High physicals at extreme temperatures.**
- **High rate of heat transfer.**
- **High impact and fatigue values.**

Because it combines all of these qualities, Ampco Metal is often called The Metal Without an Equal.

No matter what you do — whether you work in the chemical or process industries, refine oil, run a steel mill, make stampings, generate power, or any of hundreds of other jobs, you can make Ampco Metal work for you. It saves operating headaches and production grief, because it often makes good where other metals fail.

These versatile special alloys fight wear, corrosion, impact, fatigue; give long life and dependable performance under the severest conditions. That's why they are widely used in such tough assignments as fractionating towers, exchanger components, slippers and screw-down nuts for blooming mill service, aircraft parts, dies, valves, bushings, and other punishing jobs.

Chances are Ampco Metal can help you, too. It's available in sand and centrifugal castings, sheets, plates, bars, tubes, extrusions, welding wire and electrodes. Consult your nearby Ampco field engineer or write us for full information.

*Reg. U. S. Pat. Off.

AMPCO METAL, INC.
Dept. CE-3 • Milwaukee 46, Wisconsin
West Coast Plant, Burbank, California

Ampco Metal, Inc.
Dept. CE-3 • Milwaukee 46, Wisconsin

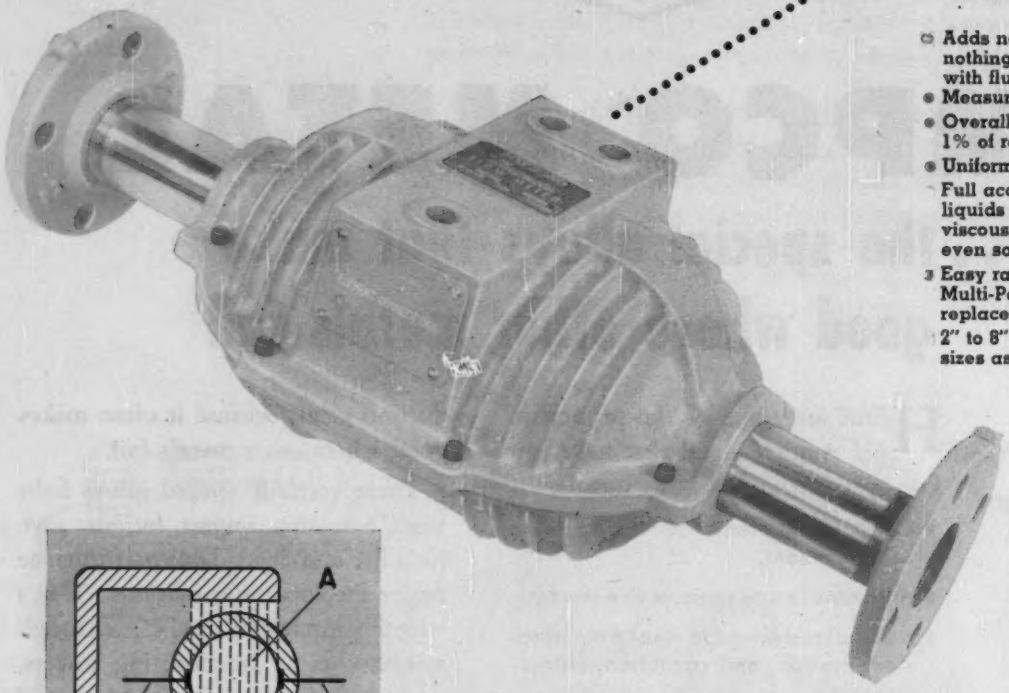
I am interested in learning more about the properties and uses of Ampco Metal in the process industries. Please send me literature.

Name.....Title.....
Company.....
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PR-16

NEW! a flow meter with no flow restrictions!





- Adds no pressure drop — nothing inside pipe to interfere with fluid flow.
- Measures fluid velocity directly.
- Overall accuracy better than 1% of range over entire scale.
- Uniform flow scale.
- Full accuracy sustained even on liquids other meters can't handle: viscous, corrosive, or pulpy — even sand-water slurries.
- Easy range change — either by Multi-Point Switch or range coil replacement, as preferred.
- 2" to 8" sizes standard — larger sizes as required.

FOXBORO MAGNETIC FLOW METER

SIMPLE, TROUBLEFREE, OPERATION

The Foxboro Magnetic Flow Meter operates on the same principle as a power generator. A magnetic field (A) is maintained through a standard pipe section (B) of stainless steel or other non-magnetic material. This pipe section is lined with Kel-F® or other insulating material. Liquid passing through pipe acts as moving conductor, generating an electric voltage which varies in proportion to liquid's average velocity. Flush electrodes (C) in pipe wall "pick up" this voltage which is recorded in desired flow units by Dynalog Electronic Recorder or Controller.

This premium-performance meter measures *magnetically* the flow rate of virtually any liquid except hydrocarbons. It completely ignores such common metering headaches as turbulence, suspended solids, and variations in conductivity, density, and viscosity. It even measures reversing flows.

Installation is simple. The magnetic spool piece connects into the line like any equivalent length of pipe — no seals, purges, meter runs, or straightening vanes required. Connects by 2-conductor cable to remote Dynalog Electronic Flow Recorder.

Maintenance is practically eliminated. There are no pressure taps to become plugged or frozen, no working parts to foul.

Foxboro Magnetic Flow Meters are already in use on such widely different liquids as beer, sand-and-water, rosin size, rock-and-acid slurry, viscose, and highly corrosive liquid detergent. Find out how this precise, troublefree flow meter can help *your* processing. Write for complete details.

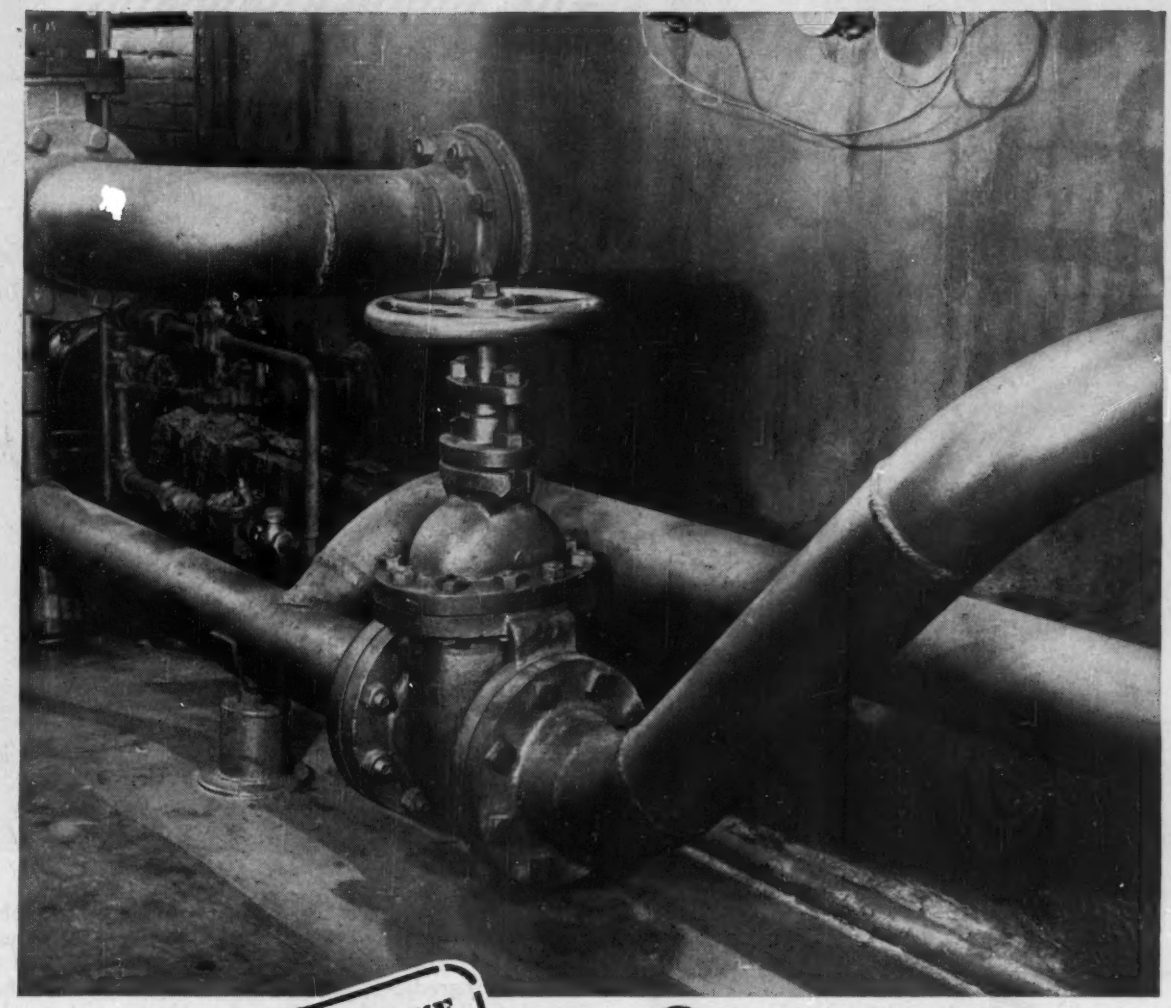
THE FOXBORO COMPANY, 363 NEPONSET AVENUE, FOXBORO, MASS., U. S. A.

FOXBORO
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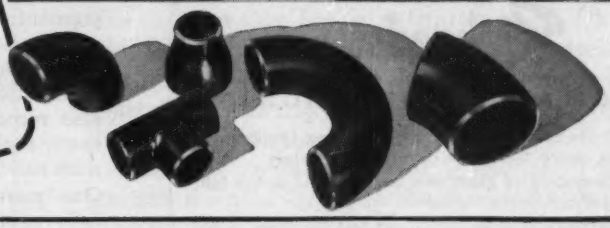
Foremost in FLOW METERING

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

How to cut corners that cost



ANOTHER JOB DONE BETTER WITH GLOBE WELDING FITTINGS



PIPING "corners" can be costly—costly in initial installation, continual maintenance, flow resistance, pressure-loss, erosion, and corrosion.

You can "cut the corners that cost" with Globe Welding Fittings. Installation is simpler—faster. Your piping is safer, stronger with less weight—needed space reduced —insulation is easier and faster. There is less chance for erosion, corrosion, and leakage to develop because of the smooth inner walls, true radii and circularity of Globe Welding Fittings. Liquids and gases flow smoothly with less resistance and pressure-loss.

Decide to "cut the corners that cost" on your next piping job — specify and use Globe Precision-Process Welding Fittings.

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Fittings Department
3839 W. Burnham St. • Milwaukee 46, Wisconsin

B&W SEAMLESS and WELDED TUBES



A prominent mid-western firm manufacturing rubber products has installed this Richardson system for remote control of formulation in the batching process. The 43 different ingredients handled include pelletized rubber, pigment fillers, accelerators, carbon blacks, and staining and non-staining oils. Solid ingredients are remotely selected and discharged from storage bins via Richardson automatic scales to a collector conveyor below. Oils are also remotely selected, and after discharge from automatic scales to pressurized surge tanks, are fed together with solids to a Banbury mixer.

One man operates this proportioning system which is fully protected from motor failure, human error, materials shortages, circuit interruptions and similar difficulties by an indicating alarm system. Control panel switches allow transfer, if desired, of the entire system to manual operation. Electrical interlocks halt the process if any major element (i.e. Banbury temperature or air pressure) fails to meet operating requirements. In the event of such deviation, or power failure, operation may be resumed from the point of interruption without recycling. Clean-out circuits are provided.

For complete case history file of Select-O-Weigh installations in industry, please ask for Bulletin 0351.

Richardson

AUTOMATIC PROPORTIONING

. . . 50 years of automatic weighing experience covering more than 400 different materials

. . . life-testing of electronic components in the lab, for maximum performance in the plant

. . . materials flow research and test facilities to coordinate material characteristics with system design

. . . a development lab working out new and better methods in automatic proportioning

. . . integration of all equipment and accessories into a complete coordinated system

. . . system completely wired and tested with test material before shipment

. . . single responsibility for the entire system, with nationwide service facilities.

Richardson

MATERIALS HANDLING BY WEIGHT SINCE 1902

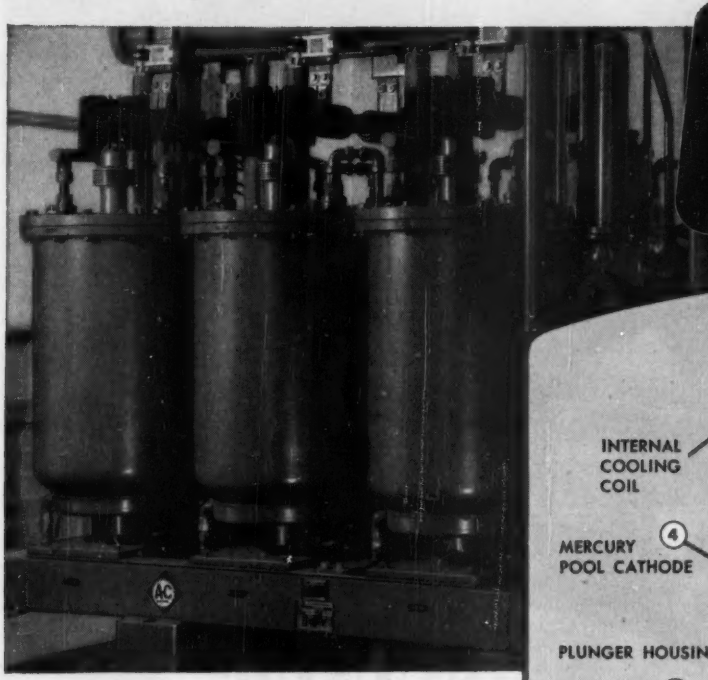
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1202

Here's the Rectifier That Needs

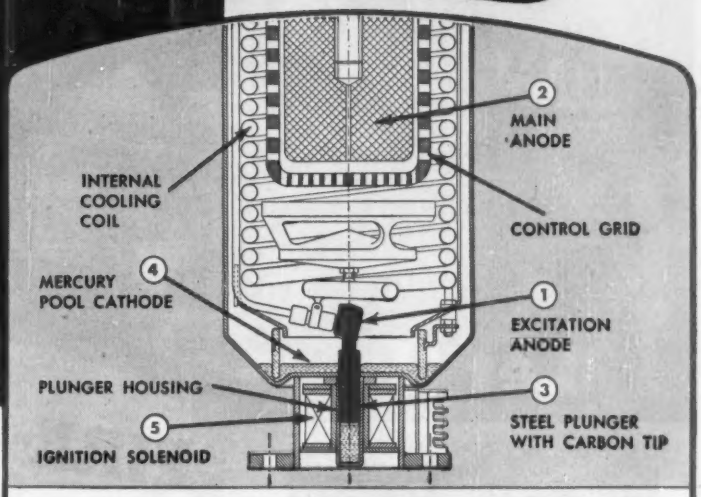
No Delicate Adjustments



This 1000-kw, 6-tube excitron rectifier is typical of units used for heavy-duty service in many industrial plants.

ALLIS-CHALMERS

Mercury Arc Rectifiers



Unique Plunger Starts Continuous Excitation

The excitron tube has an excitation anode ① in addition to the main anode ② . With the excitation circuit de-energized, the steel plunger ③ floating in the mercury pool cathode ④ makes positive contact with the excitation anode (as shown).

When the excitation circuit is energized, the ignition solenoid ⑤ pulls the steel plunger ③ away from the excitation anode ① and under the mercury pool cathode ④ , thus drawing a dc arc and forming the cathode spot, which makes conduction of load current by the tube possible.

If power is interrupted the plunger will float up, contact the excitation anode and automatically re-establish the excitation arc when power is restored.

LITTLE MAINTENANCE IS NEEDED with Allis-Chalmers excitron-type rectifiers. Excitation of the excitron rectifier is continuous, while other types of rectifiers require re-ignition 60 times a second.

Since it is more difficult to start a rectifier arc than to maintain it, the excitron rectifier is much less likely to lose excitation during operation. Momentary dips in supply voltage which are encountered in many supply systems have no effect on the continuous excitation arc.

Years of operation in hundreds of installations have proved the reliability and ease of operation of Allis-Chalmers mercury arc rectifiers. You can get complete information from your nearby A-C office. Or write Allis-Chalmers, Milwaukee 1, Wis.

A-4581

ALLIS-CHALMERS

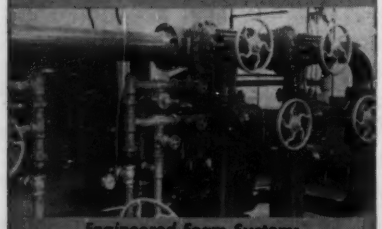
Don't Buy Fire Equipment *Piecemeal*



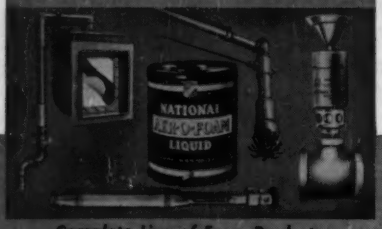
Let Us — FIRE-ENGINEER



National Foam Portable Units



Engineered Foam Systems



Complete Line of Foam Products

THE CORRECT SYSTEM FOR YOUR PLANT

You'll save money and risk by calling in National Foam "fire engineers." They survey your plant, analyze every process, location, flammable liquid used, flash points, existing system, water supply, and other factors. They recommend a basic AER-O-FOAM System with manual or automatic control, stationary or mobile operation. They prescribe the proper equipment — Foam Chambers, Overhead Units, Dip-tank Systems, Nozzles, Extinguishers. After installation you receive a complete operating manual.

Only National offers you *one source* for system design, equipment, and instant, positive, fire-tested AER-O-FOAM. Call on National today to discuss your flammable liquid risks.

Write for new, free booklet, "Foam Fire Protection."

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FOAM SYSTEM INCORPORATED
Headquarters for Foam Fire Protection — WEST CHESTER, PA

REMARKABLE NEW STEEL

for heavy-duty welded equipment

Strong, tough USS "T-1" Steel improves performance . . . reduces costs

IN this new engineering material—USS "T-1" Steel—you get a combination of mechanical properties never before obtainable in a single steel.

In "T-1" you get great strength (a yield strength of 90,000 psi.), yet you can fabricate this steel easily and at low cost. You get a steel with good creep and rupture resistance at temperatures as high as 900° F., yet so inherently tough that you can also use it in heavy duty jobs at *sub-zero* temperatures down to −40° F. In "T-1", in brief, you get a steel that withstands severe impact abrasion and, at the same time, resists corrosion at all temperatures.

This unique combination of properties helps you to cut costs and improve performance in an extremely wide range of industrial applications.

"T-1" enables you to reduce the size and weight of heavily stressed or heavily abused parts with no sacrifice in service life or dependability . . . and it enables you to increase the capacity of pressure vessels and storage tanks, to increase allowable working pressure, without increasing weight.

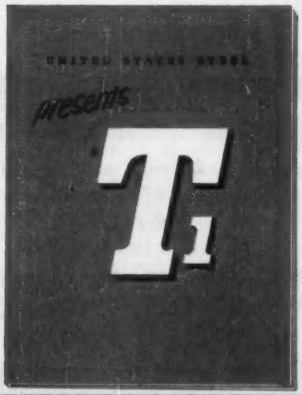
You can use "T-1" Steel to reduce fabricating costs, because you can weld it or flame cut it without pre- or post-heating. Heavy duty equipment now can be fabricated either in the shop or the field—wherever it is more convenient and less costly—without the lost time and extra expense involved in heat treatment. Remember, too, when you use "T-1" Steel to reduce the size of welded sections, you cut welding time and the amount of welding rod needed. That's more money saved.

You can use the high-temperature strength of "T-1" Steel to increase the service life of pipes, ducts, and vessels. You can use its amazing sub-zero toughness in equipment that must operate outdoors in the most severe weather. In fact, with "T-1" Steel you can increase the strength, dependability, and safety of heavy duty equipment for use at *any* atmospheric temperature. Send the coupon for complete information.

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☐ Please send me your booklet "United States Steel presents T-1" which contains the full story of T-1 steel.

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UNITED STATES STEEL

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POWELL VALVES FOR MODERN INDUSTRY

FIG. 2193—Ni-Resist* Gate Valve for 200 Pounds W.O.G.



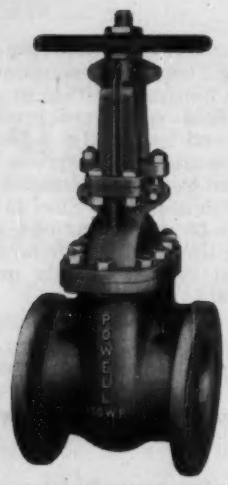
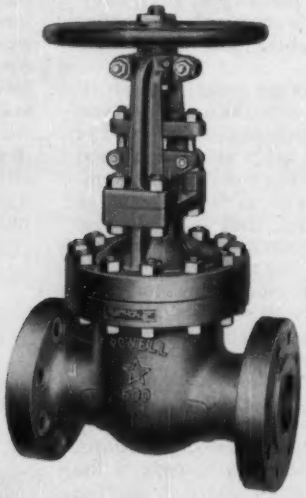


FIG. 2453 G—Stainless Steel O.S.&Y. Gate Valve for 150 Pounds W.P.

FIG. 6003 SS—Alloy Steel Gate Valve for 600 Pounds W.S.P.



*Trademark of The International Nickel Co.

. . . THE COMPLETE QUALITY LINE . . . POWELL VALVES . . . THE COMPLETE QUALITY LINE . . .

POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

When you think of valves—think of Powell. For Powell has a *complete* quality line. Powell probably makes more kinds of valves and has solved more valve problems than any other organization in the world.

Shown above are just a few Powell Valves. Investigate these valves . . . *and* the *complete* line of quality valves made of bronze, iron, steel, special alloys and pure metals.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our complete line, and help solve any flow control problem you may have. Write . . .

The Wm. Powell Company, Cincinnati 22, Ohio . . . . . 109th year

Dependable Source for Chemical Raw Materials



Edwin M. Ross, manager of production division, W. H. & L. D. Betz, Philadelphia, nationally known chemical engineers and consultants.

"Pluronics have definitely been an aid to us in water conditioning"

— W. H. & L. D. Betz, Philadelphia, Pa.

Industrial water conditioning is an exacting service business with a big future. W. H. & L. D. Betz, chemical engineers and consultants, Philadelphia, have been prominently identified with this business since 1925.

Each year, Betz mixing and formulating plants, in Philadelphia, Texas, California and Montreal, blend thousands of "prescriptions," each formulated to solve some individual water-conditioning problem for industry. These plants actually perform the function of a giant pharmacy. They are the focal point of Betz engineering skill and experience.

"In our prescriptions we use many ingredients," says Edwin M. Ross, manager of the Betz production division. "We are continuously testing new products that may help us improve our services to industry. Recently, we tested the Pluronics, Wyandotte's nonionic surface-active agents. As a result, we are now using the Pluronics in certain areas of our water-conditioning service. They have definitely been an aid to us in solving water-conditioning problems."

Have you investigated Wyandotte's Pluronics* for your products? They offer a combination of vital properties which cannot be duplicated in any other single nonionic surfactant; the Pluronics are the most versatile agents of their type available today.

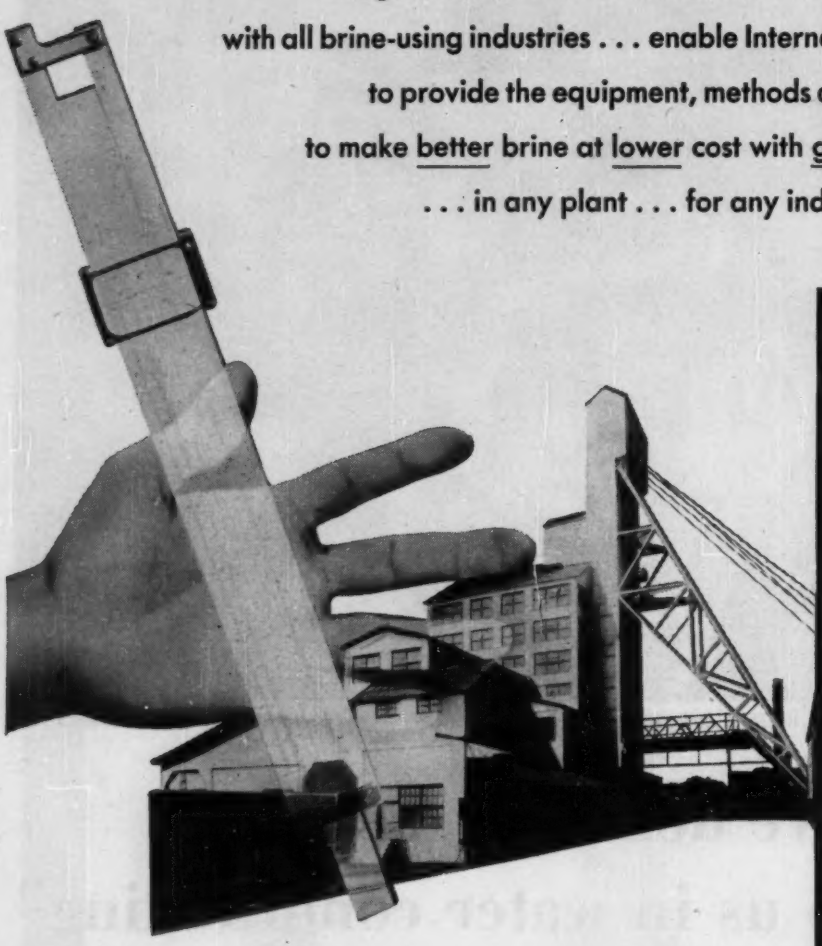
For complete technical data on the Pluronics, or on our other organic and inorganic chemicals, write us, stating your problem. We will be pleased to cooperate with you. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.* *REG. U.S. PAT. OFF.

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CHEMICALS
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The great mines . . . the refineries . . . the years of teamwork with all brine-using industries . . . enable International to provide the equipment, methods and know-how to make better brine at lower cost with greater efficiency . . . in any plant . . . for any industry.



From Sterling Rock Salt or Evaporated Salt

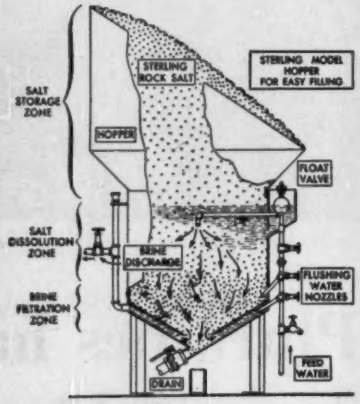
BRINE, AUTOMATICALLY MADE ... ALWAYS SATURATED ... PIPED TO ALL POINTS OF USE

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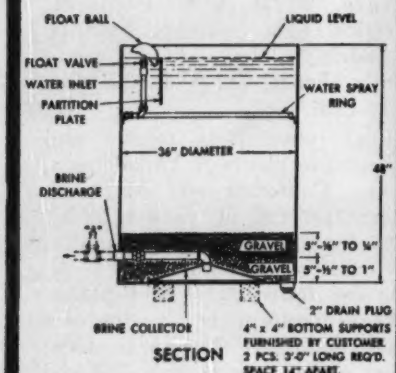
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THE STERLING MODEL
LIXATE ROCK SALT DISSOLVER



THE STERLING
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Better Things for Better Living through Chemistry

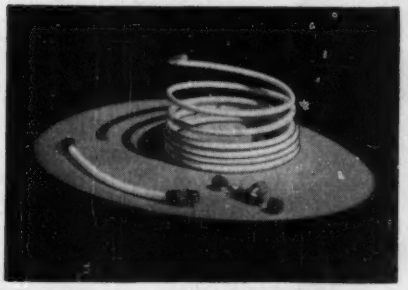
CHEMICAL ENGINEERING NEWS

PROPERTY AND APPLICATION DATA ON THESE VERSATILE ENGINEERING MATERIALS: "ZYTEL," "ALATHON," "TEFLON," "LUCITE."

NO. 1 — 1955

Thin-wall tubing of TEFLON® is chemically inert and non-contaminating

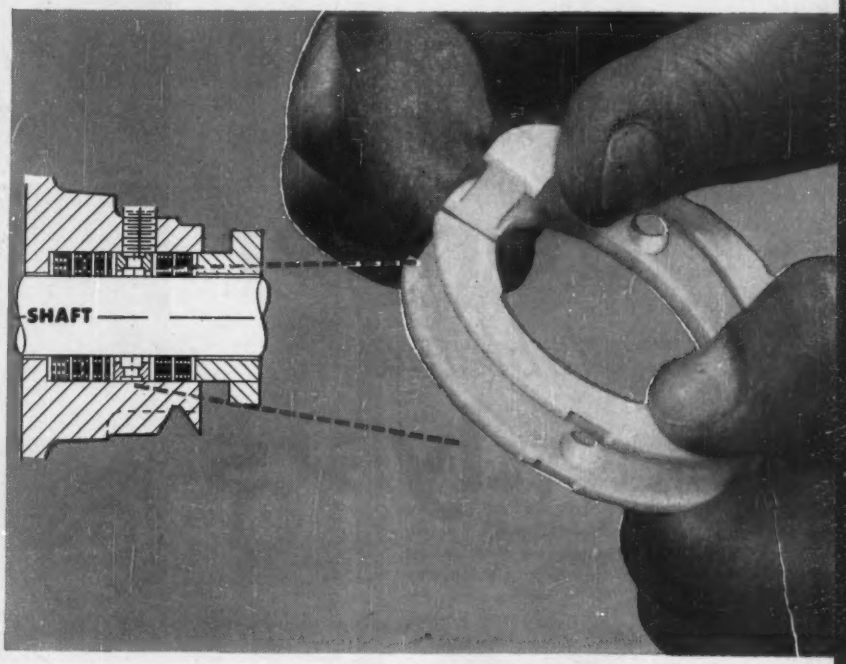
Assembly is easier with these extruded thin-wall tubings of Du Pont "Teflon" tetrafluoroethylene resin. They can be cut with a knife and bent by hand. Because "Teflon" has a smooth, waxlike surface, the tubing slips into position easily. The chemical inertness, resistance to heat and cold, strength and excellent dielectric properties give this tubing of "Teflon" a wide range of applications.



Flexible tubing of "Teflon"* is lightweight, chemically inert, has a working temperature range of —450°F. to 500°F. (Manufactured by the Halogen Insulator and Seal Corp., Franklin Park, Illinois.)



BODY BLOCK in the "Flex-i-liner" pump, manufactured by Vanton Pump and Equipment Co. Inc., New York City, uses molded Du Pont "Alathon"* polyethylene resin. It is designed to handle a wide range of corrosive fluids. "Alathon" is lightweight and stands up well against abrasive slurries. The molded construction means fewer parts.
Tough, flexible Du Pont "Alathon" is also widely used in industrial pipe applications. Use the coupon at right for complete property data on this Du Pont engineering material.



Flexible seal cage molded of Du Pont "Teflon" tetrafluoroethylene resin. It is tough, chemically inert, resists high and low temperatures. (Manufactured by Chemical and Power Products, Inc., N. Y.)

Tough, flexible seal cages of Du Pont TEFLON® snap on easily

These flexible seal cages of Du Pont "Teflon" tetrafluoroethylene resin supply annular space in packing for lubrication with oil or grease, or for cooling. They snap on and off a shaft easily—yet are tough and won't bend or collapse under extreme gland pressure. And there's no danger these seal cages of "Teflon" will score the shaft or sleeve.

"Teflon" is used extensively in process industries. Its chemical inertness, high heat resistance, low-temperature toughness and low coefficient of friction are properties especially adaptable for tough service conditions.

Use the coupon below for complete information on this versatile engineering material.

NEED MORE INFORMATION?

CLIP THE COUPON for additional data on the properties and applications of these Du Pont engineering materials.

*"*Teflon*", "*Alathon*" and "*Lucite*" are registered trademarks of E. I. du Pont de Nemours & Co. (Inc.)*
†"Zytel" is the new trade-mark for Du Pont nylon resin.

E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department
Room 253, Du Pont Building, Wilmington 98, Delaware

Please send me more information on the Du Pont engineering materials checked: ☐ "Teflon" tetrafluoroethylene resin; ☐ "Alathon" polyethylene resin; ☐ "Zytel"† nylon resin; ☐ "Lucite"* acrylic resin. I am interested in evaluating these materials for_____

NAME_____

POSITION_____

COMPANY_____

STREET_____

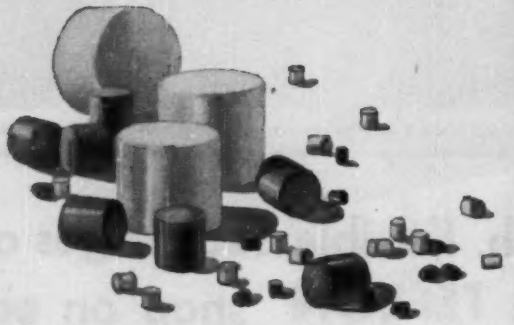
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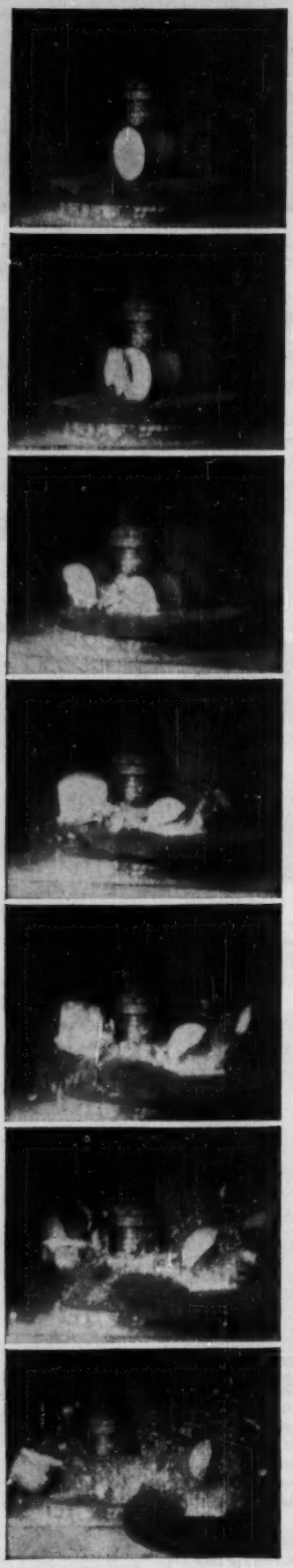
stronger *tableted* catalysts



THE HARSHAW CHEMICAL COMPANY

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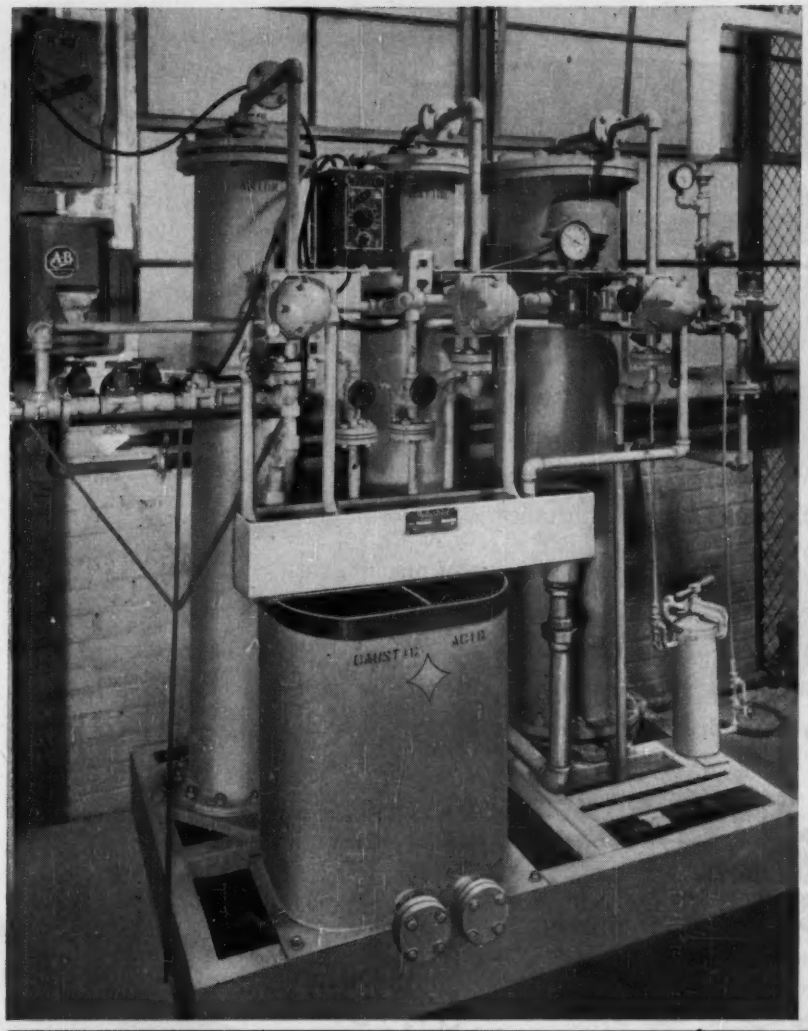
Taken at 1/20,000th of a second, the pictures show a Harshaw catalyst tablet being tested for strength—one step in our research program designed to produce more efficient tableted catalysts having the highest useful strength. Our goal, of course, is to make the catalyst you want and need. First you specify, and then we produce.

Tougher, more efficient catalysts mean fewer reactor shutdowns, and, naturally, more economic operation for you. Harshaw Catalysts mean fewer reactor shutdowns.

If your mind's on catalysts please contact us today by phone or letter.

HARSHAW CATALYSTS
available in these forms:

Tablets	Powders
Extrusions	Spheres
Granules	Rings
Flakes	



treating plating rinse wastes at

Sunbeam CORPORATION

CHICAGO 50, ILLINOIS

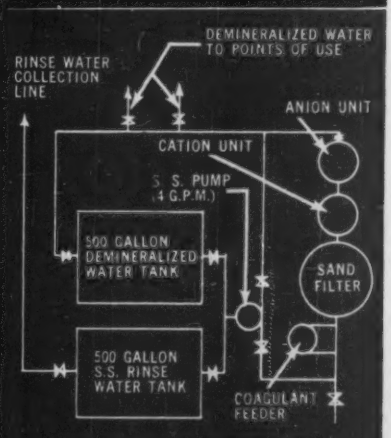
INDUSTRIAL waste treating unit consisting of rubber-lined sand filter with coagulant feeder, cation and anion exchangers complete with pumps, used for treating plating rinse water to remove gold and nickel salts, remove sulfuric and boric acids and return demineralized water to the recirculating system.

Industrial tailored treating units pay for themselves

INDUSTRIAL units for the treatment of metal finishing wastes are used for the recovery of precious metals and for supplying demineralized water for stainless rinsing. The value of the recovered metals, reuse of demineralized water in the recirculating system, and the elimination of troublesome contaminants all add up to pay for the installation, frequently within a matter of months.

Complete INDUSTRIAL Systems are individually engineered and built to meet specific waste treatment problems. Write for full particulars and recommendations.

5453



Flow diagram of the INDUSTRIAL System for the demineralization of recirculated rinse water.

INDUSTRIAL FILTER & PUMP MFG. CO.

PRESSURE FILTERS
ION EXCHANGERS
RUBBER LININGS
HEAT EXCHANGERS
CENTRIFUGAL PUMPS

WILFLEY
ACID PUMPS

INDIVIDUAL ENGINEERING ON EVERY APPLICATION

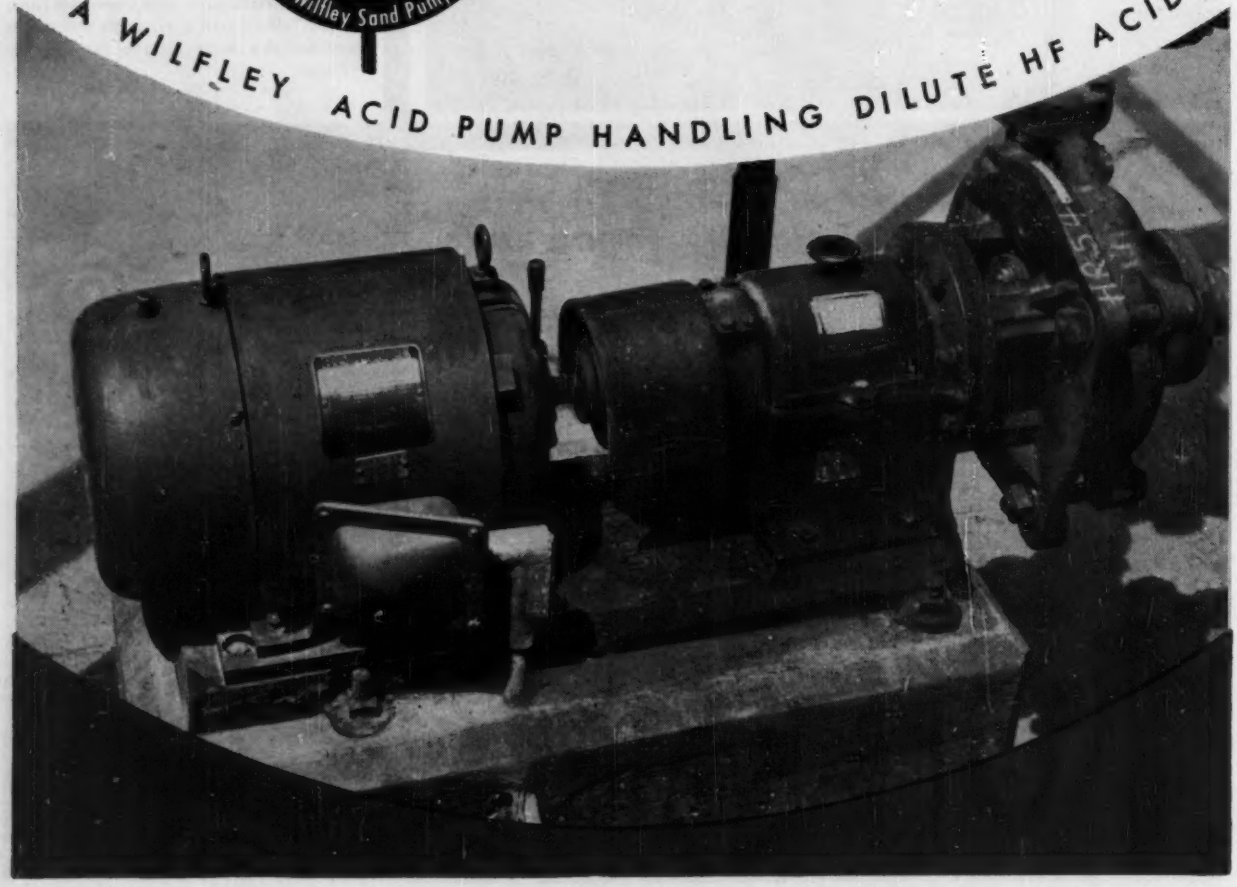
Typical of Wilfley installations in today's extremely efficient chemical plants, the Wilfley Acid Pump pictured below is a cost-reducing factor of major importance.

Available with pumping parts of machinable alloys as well as plastic to meet every problem in handling corrosives, hot liquids and other difficult solutions. Write, wire or phone for complete details.

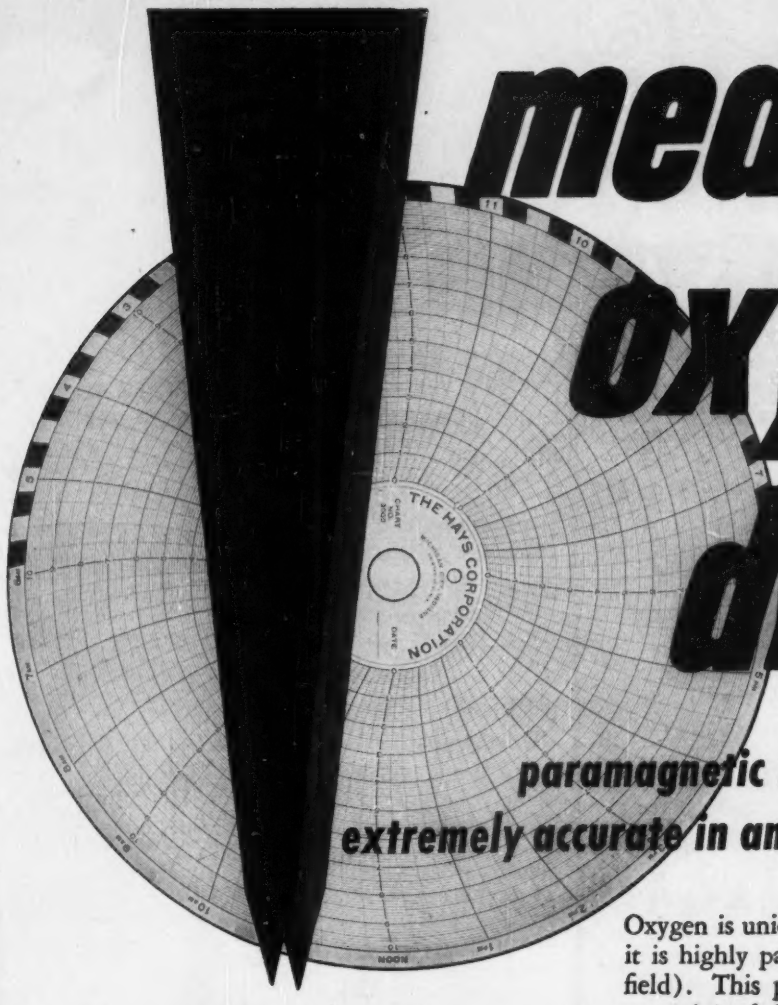
A. R. WILFLEY & SONS, INC. Denver, Colorado, U. S. A.
New York Office: 1775 Broadway, New York City

Wilfley Acid Pump
"COMPANIONS IN ECONOMICAL OPERATION"
Wilfley Sand Pump

A WILFLEY ACID PUMP HANDLING DILUTE HF ACID



measure oxygen direct



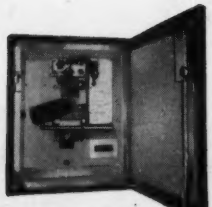
paramagnetic method of measurement extremely accurate in analyzing industrial gases

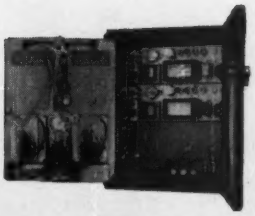
Oxygen is unique among other common gases in that it is highly paramagnetic (attracted into a magnetic field). This property of oxygen is the basis of the operation of the Hays Magno-Therm Analyzer in the analysis of industrial gases.

application

Hundreds of companies are using the Hays Magno-Therm O_2 Analyzer and Recorder in applications from revivification of SO_2 removers in manufactured gas industry and regeneration of catalysts in oil refineries to mixing air with propane to get substitute fuel. Boiler plants use it as a combustion guide because it is the only means of getting an undistorted picture of excess air.

Write today for bulletin 52-829-56 and get complete details.





ANALYZER	RECORDER
Highly sensitive to changes in oxygen content.	Self-balancing bridge circuit assures accurate, permanent calibration.
Rapid response to changes in oxygen content.	Electronic amplifier has no moving parts. High sensitivity. Rugged.
No liquid or gaseous fuel required to be added to gas sample.	Immediate response—analyzer is continuously connected to recording pen drive motor.
No chemicals required.	As many as four analyses can be recorded on the same chart.
High accuracy maintained.	Range can be changed easily in the field.
Not affected by wide variation in rate of flow of gas sample.	Isolating transformer for each amplifier removes line interference from bridge circuit.
Rugged construction. No delicate or moving parts.	Extra slide wire available for control, remote indication—for recorder or contacts for alarm circuit.
Easily installed — no special fittings required.	

Automatic Combustion Control
Boiler Panels • CO_2 Recorders
Veriflow Meters and Veritrol
Gas Analyzers • Draft Gages
Combustion Test Sets
Electronic Oxygen Recorders
Electronic Flowmeters
Electronic Feed Water Controls
Miniature Remote Indicators

THE hays CORPORATION

DAVISON BULLETIN

LIGHT AS A FEATHER

SYLOID® 244

Syloid 244 is a highly porous pure silica gel of extremely low density. A free-flowing white powder, it appears as a fluffy snow weighing 4-4.5 pounds per cubic foot as shipped. Syloid 244 has an apparent particle size of 2-3 microns, yet individual particles are predominantly below one micron.

The chemical and physical characteristics of Syloid 244 makes it adaptable for many uses including the following:

- anti-blocking of clear plastic film
- an additive to inks for quick-drying
- a vinyl flatting agent
- anti-caking for powdered products
- thickening agent for salves, lubricants and plastigels

Progress Through Chemistry

DAVISON CHEMICAL COMPANY

Division of W. R. Grace & Co.

Baltimore 3, Maryland

Producers of: Catalysts, Inorganic Acids, Superphosphates, Triple Superphosphates, Phosphate Rock, Silica Gels and Silicofluorides. Sole Producers of DAVCO® Granulated Fertilizers.

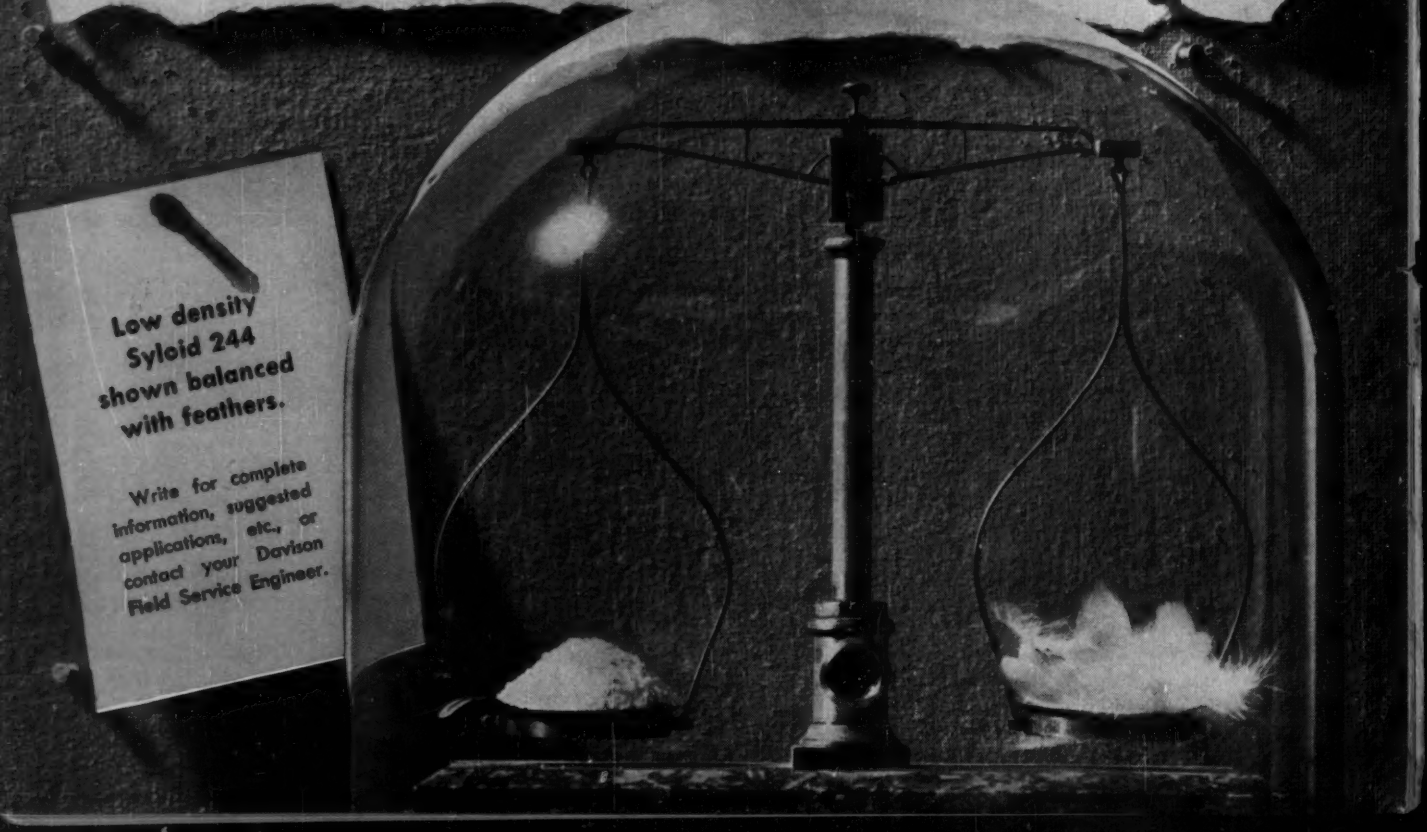
TYPICAL CHEMICAL AND PHYSICAL CHARACTERISTICS OF SYLOID 244

Color	white, 94 Hunter reflectometer transparent in vehicles
Appearance	uniform, free-flowing powder
Density	
as shipped	4-4.5 lbs./cu. ft.
centrifuged in toluol	7.5 lbs./cu. ft.
true (specific gravity)	2.1-2.2
pH	7.2
Silica as SiO_2 (dry basis)	99.5%
Oil adsorption	240 lbs. oil/100 lbs. SiO_2
Surface area (nitrogen)	292 M_2/gram

PARTICLE SIZE DISTRIBUTION BY WEIGHT

(water sedimentation)

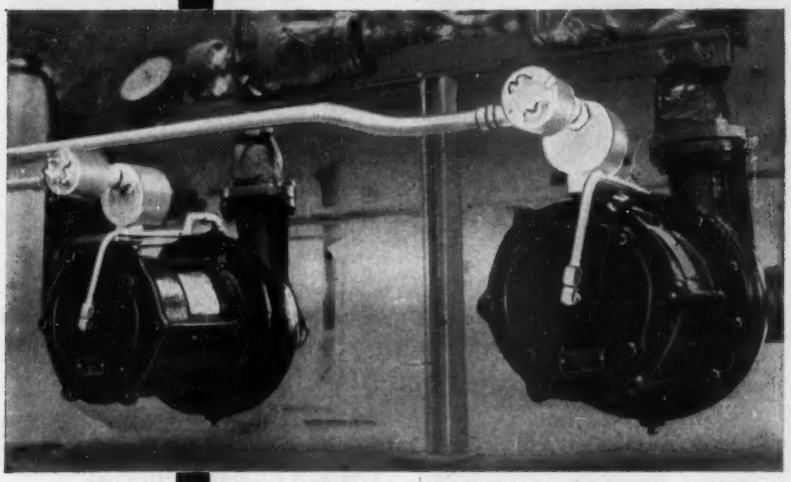
	5% less than 1.1 microns
10	1.4
20	2.0
40	3.0
50	3.7
60	4.5
80	7.0



Chempump

handles problem fluids without failure or leakage of any kind...

at large midwestern chemical plant



Two 2-hp. *Chempumps* on 0°F service, handling liquid which tends to polymerize on contact with air . . . thereby forming hard crystals which could cause operational trouble with ordinary pumps.

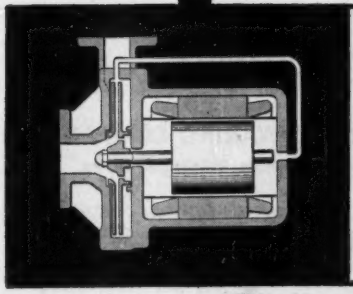
PROOF through *performance* is what sold this big chemical company on seal-less, leak-proof *Chempump.*

In one particular process, one man was kept busy just maintaining seals on small centrifugal pumps. When the *Chempump* was introduced, problem fluids were handled without failure or leakage of any kind. So far, maintenance has been no problem. The service these seal-less pumps have given is felt to more than justify the higher initial equipment outlay.

This is just another example of how *Chempump* has licked tough leakage problems! With this seal-less combined motor and pump unit, normally hard-to-handle fluids can't leak or become contaminated. Periodic inspection to indicate necessity of simple bearing change is the only maintenance required.

Your process can benefit through *Chempump*, too. For details, send for new 16-page Bulletin 1010. Chempump Corp., 1300 E. Mermaid Lane, Phila. 18, Pa.

Engineering representatives in over 30 principal cities in the United States and Canada.



Chempump combines pump and motor in a single hermetic unit. Pumped fluid enters rotor chamber; no shaft sealing device required.

Approved by Underwriters' Laboratories. Available in wide choice of materials . . . from ⅛ to 7½ hp. Capacities to 250 gpm. Heads to 195 feet.

Chempump can't leak!

Chempump—

first in the field . . . process-proved

Please send me details on *Chempump* for:

_____
(application)

*Capacity*_____ *Total dynamic head*_____

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

which impulse for you?



STANDARD

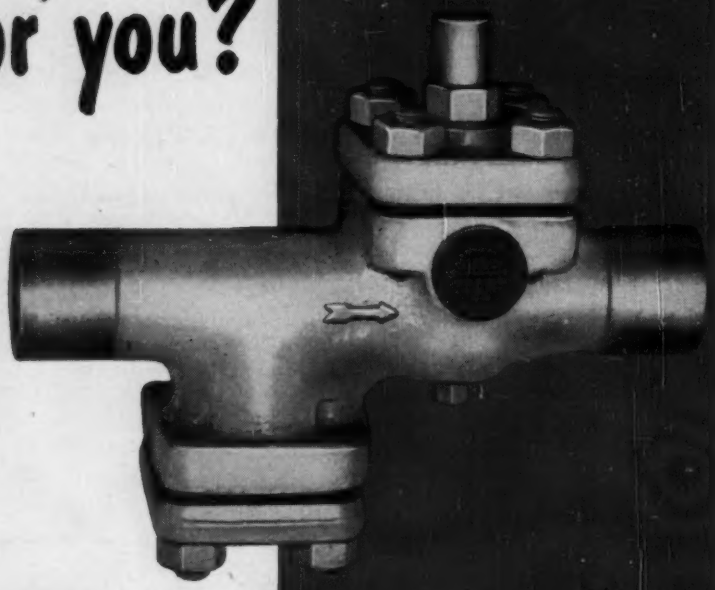
The standard YARWAY Impulse Steam Trap serves all normal trapping requirements. Factory set to operate without adjustment at all pressures from 20 psi to 400 psi (Series 60) and 600 psi (Series 120). For pressures below 20 psi, merely remove split washer.

Numerous advantages like:

small size
quick heating
steady temperatures
stainless steel construction
one moving part
non-freezing
low cost

More than 900,000 used throughout industry.

Write for YARWAY Bulletin T-1740.



HIGH PRESSURE, INTEGRAL STRAINER

YARWAY Integral Strainer High Pressure Impulse Steam Traps operate on some of the highest pressure steam lines in the country. Same operating principle as the standard YARWAY Impulse Trap. Strainer built into trap.

Ample capacity when system is being "warmed up"—yet will handle relatively small amounts of high temperature condensate without losing prime. Six sizes—½" to 2". Pressures to 1500 psi (flanged ends) or 2500 psi (welding ends).

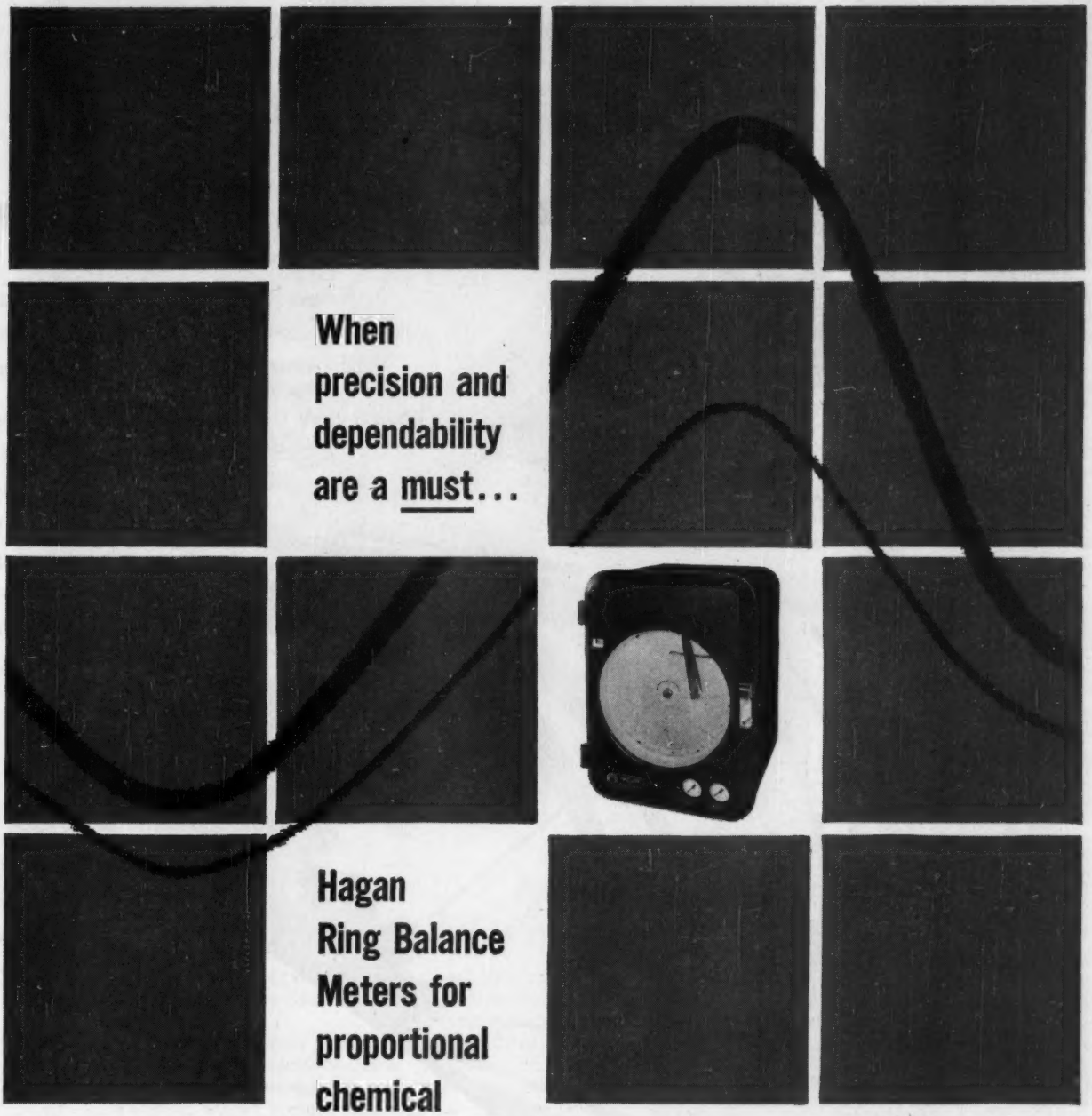
Write for YARWAY Bulletin T-1740.

YARNALL-WARING COMPANY
137 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY

impulse steam traps

YARWAY Impulse Steam Traps and Fine Screen Strainers are stocked and sold by more than 250 convenient local distributors. Write for name of one nearest you.



When precision and dependability are a must...

Hagan Ring Balance Meters for proportional chemical feeding

The inherent accuracy and positive action of the Hagan Ring Balance Flow Meter, teamed with the Hagan Pneumatic Transmitter, make possible *precise* chemical feeding in a variety of systems.

Hagan Proportional Chemical Feeding Systems are available for a full range of applications—for the continuous or intermittent feeding of solutions, slurries, corrosive fluids or acids, or, in fact, wherever precision and dependability are essential.

Hagan Ring Balance Instruments are controlling chemical feeding with the following types of feed systems—

Continuous: variable stroke pump—variable speed V-belt drive—variable speed d-c motor—time pulse system—dual metering (both flow meters in a single case)—intermittent proportional feed—Also: proportional sampling.

Hagan Control systems are in successful operation on these and other applications. A phone call or letter will bring you Bulletin MSA 102, which contains detailed information on the application of Hagan Ring Balance Instruments to the problem of Precise Proportional Chemical Feeding.

HAGAN HALL BUROMIN CALGON

HAGAN CORPORATION

Hagan Building • Pittsburgh 30, Pennsylvania

Boiler Combustion Control Systems • Ring Balance Flow and Pressure Instruments • Metallurgical Furnace Control Systems Control Systems for Aeronautical and Automotive Testing Facilities

Photo courtesy of Eimco Corp.

The right fabric adds efficiency to continuous operation



Probably better than any other, the chemical and processing industries know the importance to filtration of fabrics "engineered" for the job.

We know it, too. Consider the filtration of coal slimes in continuous vacuum filters, for instance. Supplying the correct fabric construction means more than just assuring continuity of operation.

It means adding efficiency and a higher rate of flow through a well-made, well-fitted fabric that avoids blinding—assures easier cake discharge.

But your problem is different? Of course, it is. Why not talk it over with one of the leading filtration specialists who distribute our fabrics? See what type of Wellington Sears cotton or synthetic might help solve it.

We will be glad to supply the names of distributors, together with a free copy of "Filter Fabric Facts"—illustrated booklet on filter fabric development and application.



Wellington Sears

A Subsidiary of West Point Manufacturing Company

FIRST In Fabrics For Industry

Wellington Sears Company,
65 Worth Street, New York 13, N. Y.

Offices in: Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

BAD AIR IS COSTLY...



... as compared to the blower that keeps air fresh

Your men can't produce at top efficiency when stagnant, hot or fume-filled air robs them of their energy.

Wherever bad air slows down production . . . in shipholds, tanks, drums, boilers or other places where men need fresh, cool air . . . a Coppus Blower becomes both a safety device and a production tool.

Portable and easily adaptable for special purposes, Coppus "Blue Ribbon" Blowers and Exhausters fit all your "fresh air" requirements. The Coppus "Blue Ribbon" means premium performance at ordinary cost. Check and mail the coupon for specific information. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

OTHER COPPUS "BLUE RIBBON" PRODUCTS



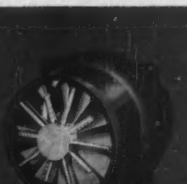
HORIZONTAL TURBINE
Six frame sizes—
1 to 150 horsepower



VERTICAL TURBINE
Six frame sizes—
1 to 150 horsepower



FANMIX GAS BURNER



FANMIX GAS-OIL BURNER

MAIL THIS COUPON To Coppus Engineering Corp., 223 Park Avenue, Worcester 2, Mass.

PLEASE SEND ME INFORMATION ON SUPPLYING FRESH AIR TO MEN WORKING:

- ☐ In tanks, tank cars, drums, etc.
- ☐ in underground cable manholes.
- ☐ in aeroplane fusilages, wings, etc.
- ☐ on coke ovens.
- ☐ on steam-heated rubber processes.
- ☐ on boiler repair jobs.

COOLING:

- ☐ motors, generators, switchboards.
- ☐ wires and sheets.
- ☐ general man cooling.
- ☐ around cracking stills.
- ☐ exhausting welding fumes.
- ☐ stirring up stagnant air wherever men are working or material is drying.
- ☐ drying of walls, sheets; etc., after treated with coating material.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....

(Write here any special ventilating problem you may have.)

Make sure the screw conveyors you buy pass this quality test!

If they don't . . . investigate LINK-BELT's sound engineering and quality manufacture . . . your assurance of top performance

1. Is flighting accurately formed?



Link-Belt's specialized machinery assures accurate forming, producing uniformity of flighting curvature.

2. Are diameters uniform?



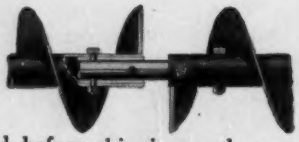
Only specially selected steels are used to meet Link-Belt's rigid specifications.

3. Will the hangers match your exact needs?



Hangers are available in gray iron or steel frames in a range of styles and with various bearing materials.

4. Will installation be easy?



Straightness is checked before shipping, and extra care is taken in handling and loading. Jig-drilled coupling bolt holes facilitate assembly.

5. Can gates be installed on the job?



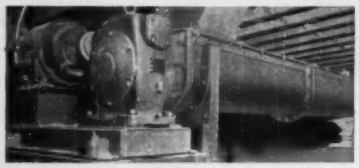
Gates are available for bolting or welding in place right on the job for ease of trough opening location.

6. Are troughs fabricated to your specifications?



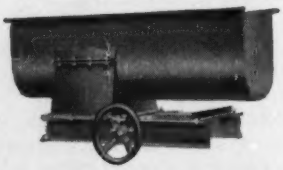
Link-Belt's accurate fabrication assures better fit of all components. Choice of metals to fit your need.

7. Is the drive fully integrated?



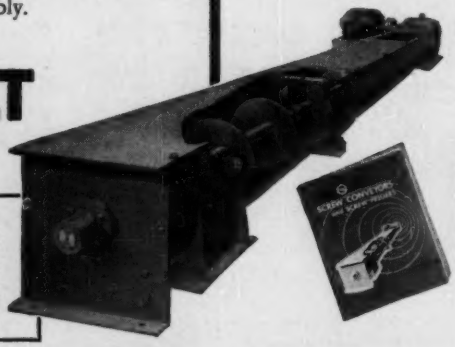
Only Link-Belt builds a complete line of gear and chain drives, couplings, bearings, shafting.

8. How wide a choice of spouts and gates do you have?



Discharge spouts and gates can be fixed or detachable. Hand or rack-and-pinion, flat or curved slide gates.

9. Is full ordering information readily available?



Link-Belt's 92-page Screw Conveyor Book 2289 contains complete ordering data. Ask your Link-Belt representative or distributor for your copy today.

LINK-BELT

13,820 **SCREW CONVEYORS**

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.


UNIBESTOS
FOR YOUR MOST EXACTING
INSULATION REQUIREMENTS
Tough. Will not crack, crumble or powder
Withstands impact from bumps, abrasion
Designed for temperatures up to 1200°
Unaffected by water, vapor, chemical fumes
Reusable - Low maintenance cost
Features single layer application
Easy to cut, saw, miter
Hard, smooth, easy-to-paint surface
No breakage loss in shipping
Low thermal conductivity
write for illustrated Brochure
UNARCO
UNION ASBESTOS AND RUBBER COMPANY



NORWOOD CONTROLS Gyro Mass Meter. *To measure true mass flow directly, the flowing stream is sent through a pipe configuration so that the mass of material flowing corresponds to a rotating gyro wheel. When the gyro is precessed by rotating the pipe about the axis of flow, it provides a torque which is directly proportional to the mass flow of the material flowing through the pipe.*

lbs. not gals.

The inherent — and costly — inaccuracies in measuring flow by volume have long been recognized. But could a practical, economical way be found to provide meter accuracy which would be fundamentally independent of temperature, pressure, density and viscosity? The answer is now supplied by the NORWOOD CONTROLS Gyro Mass Meter which measures — or meters — flow by weight, not volume.

With the Gyro Mass Meter, accuracies of measurement are attainable for the first time that meet cost-accounting standards in a variety of continuous flow batching, blending, proportioning, bulk metering and process control applications. Since most of the commerce in bulk fluids is currently transacted on a weight basis, doesn't it make sense to use an instrument that measures *directly* in pounds or tons?

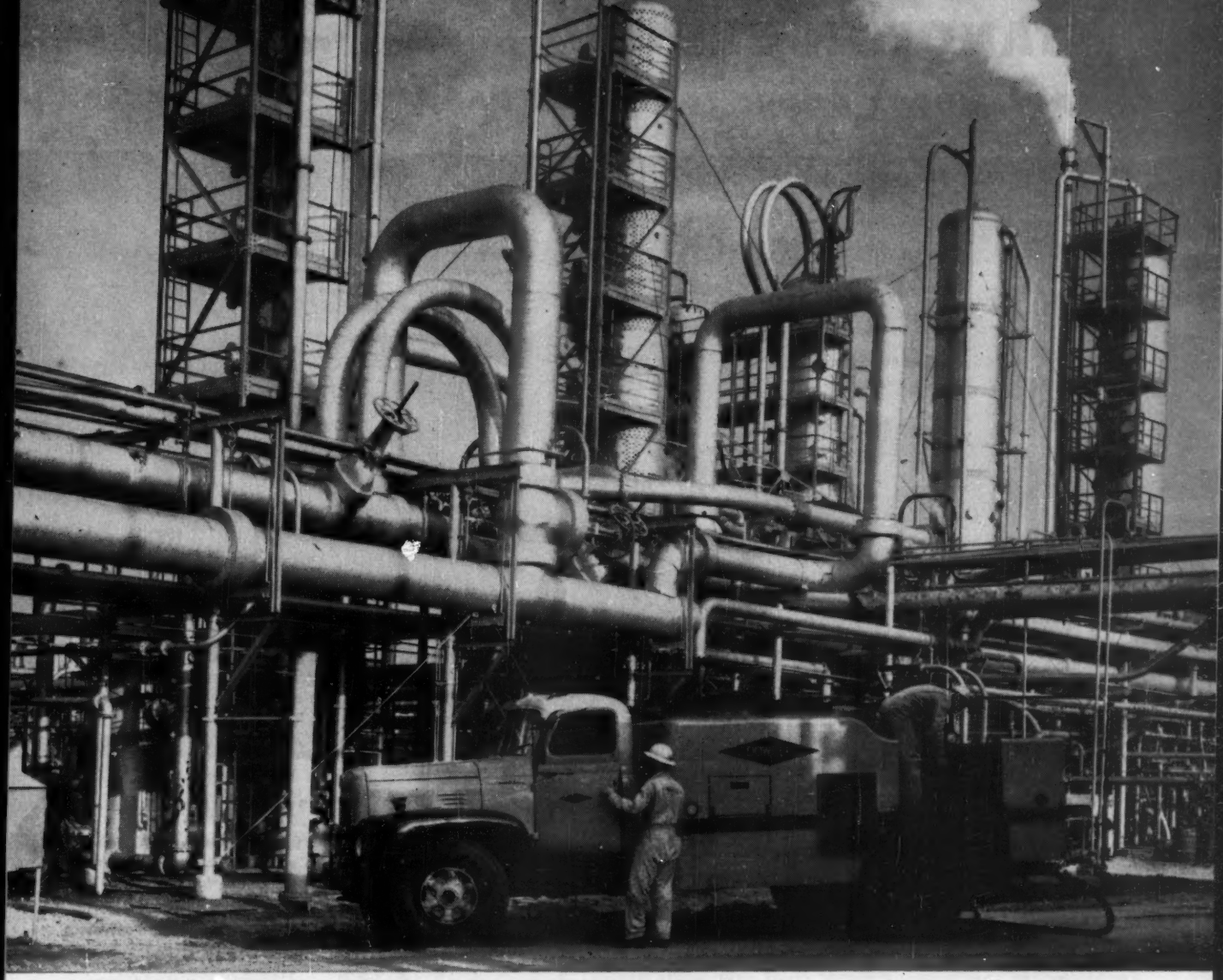
NC NORWOOD CONTROLS

Controls Division

CONTROL ENGINEERING CORPORATION

935 Washington St., Norwood, Mass.

Complete technical information will be supplied upon request



SIX DAYS OF DOWNTIME SAVED

Refinery tower cleaned chemically by Dowell in only eight hours . . . a six-day saving over mechanical methods!

A refinery operator had to shut down his H_2S stripper bubble cap tower every two months to remove an oily carbonate scale. Each shutdown took seven days, because of the mechanical cleaning methods used, and even then the tower was not thoroughly cleaned.

Dowell engineers were asked to tackle the problem. They cleaned the tower in just eight hours, using chemical solvents. Visual inspection showed the tower to be free of scale with all loose deposits washed from the caps and trays. The operator of this refinery was so impressed that he adopted a regular schedule of Dowell chemical cleaning.

Dowell chemical cleaning methods are designed to reduce costly downtime, because solvents are introduced through regular connections, keeping dismantling at a minimum. Liquid solvents can go wherever gases or condensates flow —to clean angles, bends and other irregular surfaces inaccessible to mechanical methods.

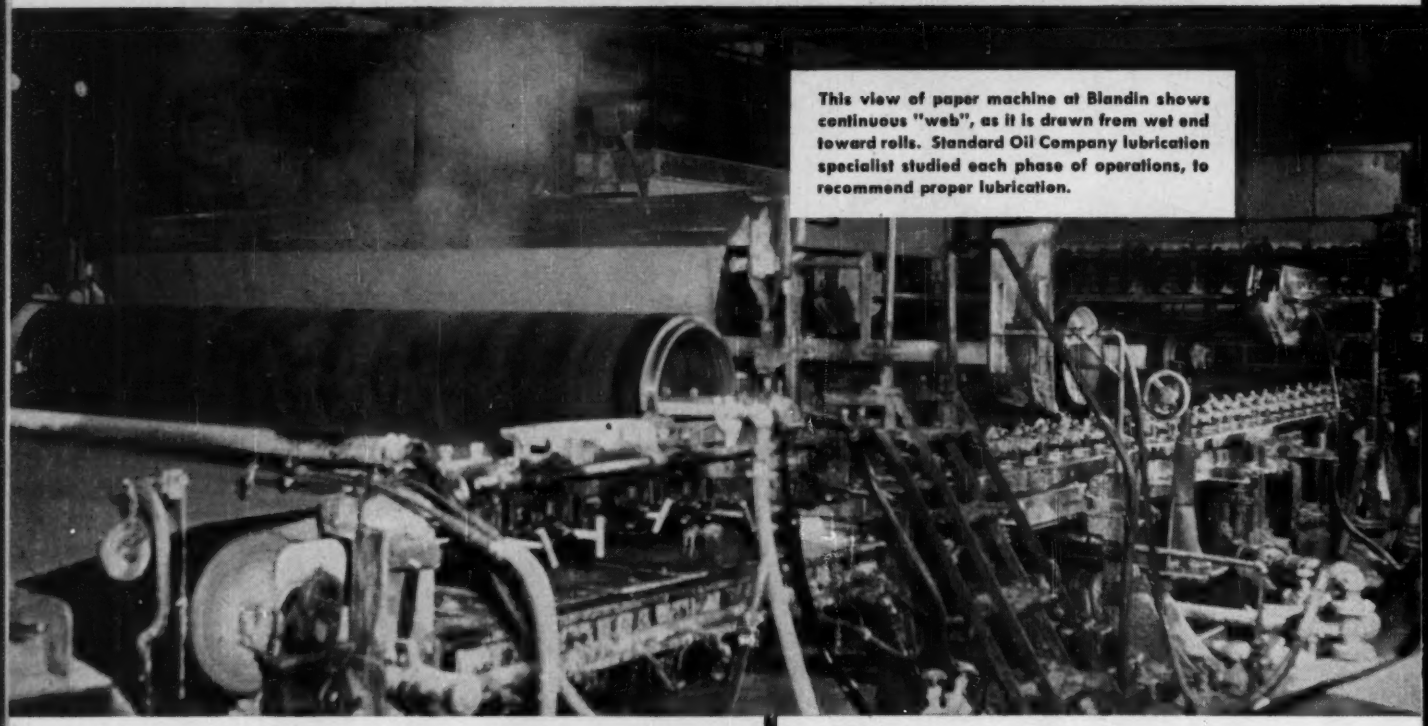
You can help to maintain maximum operating efficiency in your plant by arranging for a regular program of Dowell chemical cleaning. For full information, call your nearest Dowell office, or write Dowell Incorporated, Tulsa 1, Oklahoma, Department C-33.

chemical cleaning service for industry

DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

STANOLITH GREASE *overcomes trouble spot, keeps paper rolling at* BLANDIN



This view of paper machine at Blandin shows continuous "web", as it is drawn from wet end toward rolls. Standard Oil Company lubrication specialist studied each phase of operations, to recommend proper lubrication.

STANOLITH Grease aided the solving of a rough lubrication problem at Blandin Paper Company in Grand Rapids, Minnesota.

A bottleneck on the paper making machines threatened production at this hustling paper plant four years ago. The trouble occurred near the beginning of the process, where the pulp contains up to 99% water. At this point, bearings are greeted by a shower of water and stock.

Greases were quickly lost, literally washed away. Bearings were ruined early in life. Not only had greases failed in their duty but they caused paper staining.

A Standard Oil lubrication specialist recommended STANOLITH Grease for use on the wet end of the paper machine. It did such a good job that Blandin maintenance personnel put this multi-purpose grease to work on other applications, too. Now, except when open gear and brick greases are required, STANOLITH serves the entire plant, replacing a wide number of single-duty products.

STANOLITH is truly a multi-purpose grease. It may be used almost anywhere on the job, in mechanical or hand-operated dispensers. STANOLITH Grease is heat and water resistant. It will reduce grease inventories, eliminate waste and prevent costly application errors. Find out more about how STANOLITH Grease can help you do many tough lubrication jobs with just *one grease!* In the Midwest call your nearby Standard Oil lubrication specialist. Or contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Blandin maintenance man, Fred Harwood (left), and I. A. Westerlund, Standard Oil lubrication specialist, inspect a table roll bearing. This is just one of many places in the plant where STANOLITH Grease provides top-efficiency lubrication.

I. A. Westerlund is a graduate of the University of Minnesota with an engineering degree. He is also a graduate of Standard's Sales Engineering School, and makes good use of his training in providing technical service to customers. He's been doing this for 14 years. His customers find this experience and training pay off *for them.*



STANDARD

STANDARD OIL COMPANY (Indiana)



"International" MIXERS

Tailored for the job—

But Basically Designed for Contingent Modification

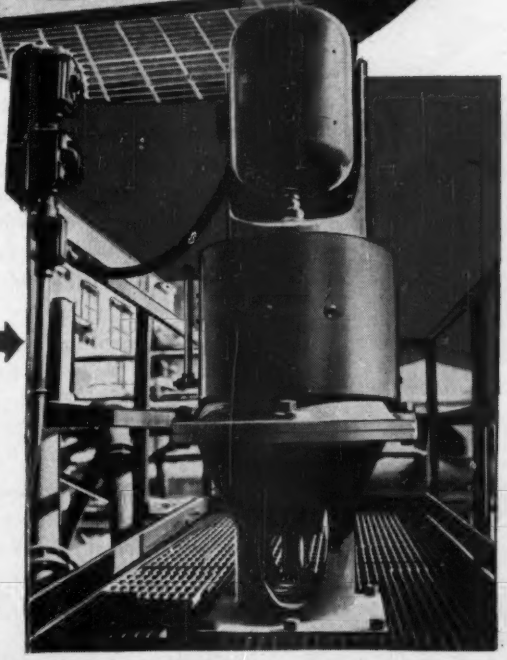
After all, it's PERFORMANCE that counts. Engineers agree that efficiency comes first in profitable operation, and a Mixing unit designed for the purpose at hand (with adaptability to similar operations) will deliver superior performance and optimum results. INTERNATIONAL Mixing and Processing Equipment is preferred by Engineers because they know it is made and Guaranteed for a specific purpose—to do it better and at less cost. It's adaptability to other similar operations is an extra advantage to the user, where modification due to normal process changes become necessary. Motors, Gear Ratios, Shafts and Shaft Diameters as well as Turbine Elements are of course, interchangeable within normal limits, at minimum time and expense.

Wherever you find INTERNATIONAL Equipment you'll find a pleased user—and you'll find it in practically every segment of the Chemical, Pharmaceutical, Ceramic, Industrial and Petroleum industries. Remember to investigate "INTERNATIONAL" when you want Guaranteed Performance.

Type LFR "INTERNATIONAL" Slow Speed Turbine Type Mixer

Type GFR "INTERNATIONAL" Slow Speed Turbine Type Mixer

Courtesy of International Minerals & Chemical Corp., Bartow, Fla.



INTERNATIONAL ENGINEERING, INC.

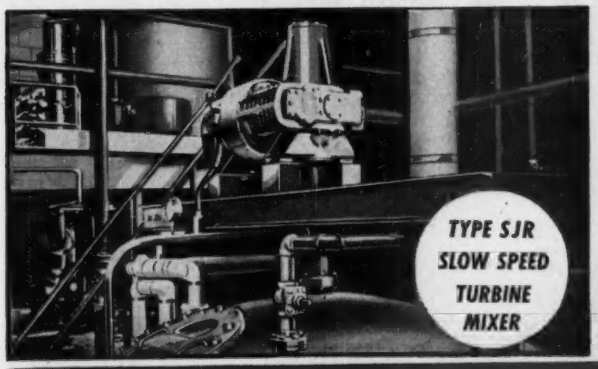
DAYTON 1, OHIO

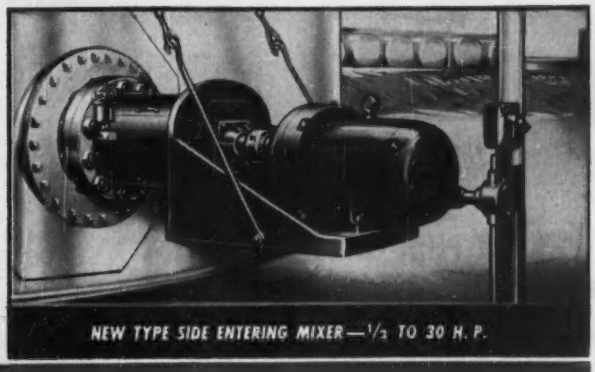
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TECHNICAL BULLETINS AVAILABLE

In the interest of intelligent Engineering Cooperation, INTERNATIONAL issues Technical Bulletins on the various phases of Mixing and Processing, which will be gladly sent on request. Simply indicate the subjects in which you are interested.

Top Entering Mixers and Agitators	73-76
Side Entering Mixers and Agitators	72-A
Dry Blenders and Ribbon Mixers	78
Grinding and Mulling Pans	5-A
Portable Mixers	74-A
Mixing and Extruding Machinery	62-A
Ball and Pebble Mills	100
Continuous Mixers	A
Stack Fans and Duct Boosters	109-A
Laboratory and Pilot Plant Equipment	77-A



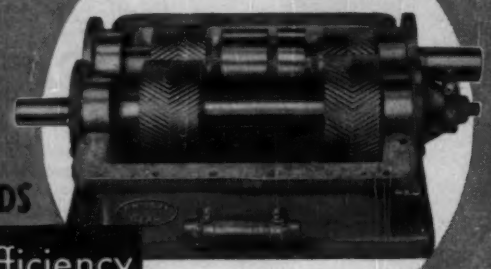


NEW TYPE SIDE ENTERING MIXER—1/2 TO 30 H. P.

a "standardized" line

GEARED, SELECTIVE TYPE

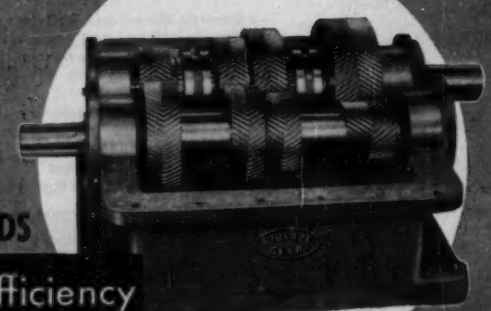
CHANGE SPEED UNITS



2 SPEEDS
97% efficiency



3 SPEEDS
96% efficiency



4 SPEEDS
95% efficiency

The Philadelphia self-contained, compact all geared type Speed Change Units are available in 2, 3 and 4 speed changes, providing definite ratios of Speed Reduction, Speed Increasing (or a combination of both). Speed changes are accomplished by just the "mere turn of a control lever."

These exclusive units were designed to fill Industry's need for a highly efficient, precision-built standardized line . . . to eliminate the high cost and delayed deliveries of specially designed units.

Gear specifications: All gears and pinions are Sykes Continuous Tooth Herringbone type, precision cut of involute shape, carefully heat treated and finished, and designed for maximum tooth contact and overlap.

All component parts and materials in these unusual Units are of highest quality and workmanship: Housings, Shafts, Bearings, Clutches, Lubrication Systems, etc.

Ratings are according to AGMA recommendations for continuous service, with allowance for 100% overload in starting and for momentary shock loads . . . shafts and bearings are of proper size to permit heavy overhung loads resulting from use of sprockets or pulleys.

Be convinced, write for 24 page illustrated catalog #CSU-52.

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Industrial Gears & Speed Reducers

LimiTorque Valve Controls
ESTABLISHED 1892

SK apades in industry

Take pity on Herman
(an overworked engineer).

With time at a premium, busy, *busy* Herman had to devise a method for removing highly corrosive pickling liquor from a tank. Since the tank was constructed with a rubber membrane and a brick lining, it was important that the rubber membrane not be broken for a drain connection.

Herman decided a jet was ideal for the job. Herman was right! He took pencil, paper, and slide rule in hand and settled down to



THE CASE OF THE JET APPLICATION AND THE OVERWORKED ENGINEER

work out the problem . . .

Syphon? Eductor? Exhauster, compressor, jet vacuum pump? psi? gpm? Derivation, computation, check.

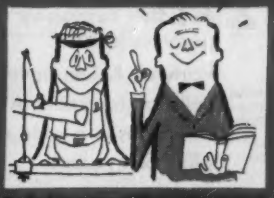
Herman was wrong! And, he knew it—knew there had to be an easier and better way. So this is what he did . . .



Sent for Schutte and Koerting Company's copy of their Bulletin J-1 on "Jet Apparatus and its Industrial Applications." Found out what he needed to know about the characteristics, varieties, and ranges of Jet Apparatus.



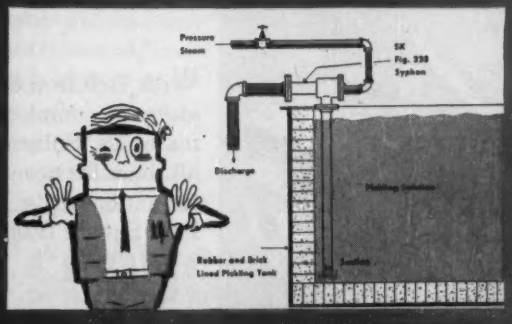
Learned the functions required and the types of Jets suitable for such a function. Identified the type most suitable for his particular requirements.



Called in a representative of the nearest SK Sales Engineer—who gave him a specific recommendation.

SOLVED THE PROBLEM EASILY!

The SK Fig. 220 Steam Jet Syphon shown, made of special corrosion resistant materials, is being used to empty spent pickling liquor from a pickling tank. Since the liquid is corrosive and the tank is lined with rubber and brick, draining is done from the top. The syphon provides high suction lift, resists corrosion, is ideal for intermittent operation.



Moral! Request a copy of Bulletin J-1 for your files. Make use of a qualified specialist, your nearest SK Sales Engineer.

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Jet Apparatus • Heat Transfer Equipment
Strainers • Condensers and Vacuum Pumps
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Flow Indicators • Radiafin Tubes • Valves
Spray Nozzles and Atomizers • Gear Pumps
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ATTENTION PLANT ENGINEERS!

In considering rigid, unplasticized Polyvinyl Chloride pipe, valves, fittings or custom fabrications watch for these 4 important factors:

1 Is the product properly manufactured?
Boltaron 6200 is produced under rigid standards by the Bolta Division of The General Tire and Rubber Company.

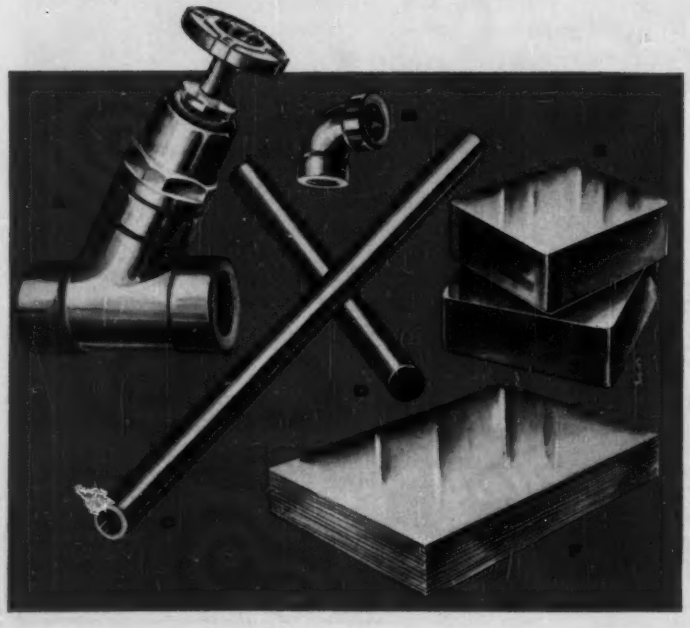
2 Is it properly fabricated and designed?
Only well-trained, experienced engineers and fabricators are qualified to fill your individual needs. Every Boltaron fabricator in the United States and Canada is trained and licensed by Hartwell & Son.

3 Is the application right?
Unplasticized PVC is NOT a panacea for all industrial ills. It can and will perform with a high degree of satisfaction when properly applied to your specific problems.

4 Are the company and the product proven in use?
Hartwell & Son have been exclusive distributors of Boltaron for years. A list of their many successful installations in a wide range of industries can be supplied on request.

Boltaron 6200





With Boltaron 6200 you can obtain *from one source* a complete line of unplasticized PVC materials. Substantial inventories are kept at all times for prompt shipments. For further information write H. N. Hartwell & Son, Inc., Park Square Building, Boston, Mass., Box 109.

A All-Molded Valves
B Molded Fittings
C Seamless Pipe
D Rod Stock
E Block Stock
F Sheet Stock

The best answer to many corrosion problems...

TITANIUM



End view of titanium diffuser. Note acid attack on cast iron flange.

Titanium steam jet diffuser easily passes 2 year acid test

Here's an instance of titanium's excellent performance under severe corrosive conditions. At a Du Pont Pigments plant a combination of chemical vapors and high-velocity steam proved too much for ordinary steam jet diffusers in service. Biting hydrochloric acid formed in the line and cut the service of cast iron diffusers to less than 3 months. Other diffusers of bronze and corrosion-resistant alloys were tried without improvement.

Finally, a diffuser of titanium was fabricated and installed. It's still on the job after a period of over 2 years of uninterrupted service—more than *ten times the average life of other diffusers!* And today, there's not a sign of wear or corrosion on the diffuser.

Resists chlorides and other corrosive chemicals as no other structural metal can!

Here are just a few of the corrosive environments where titanium offers corrosion resistance unmatched by common structural metals.

INORGANIC CHEMICALS	CONDITIONS	POSSIBLE APPLICATIONS
Ferric Chloride	0-30% at 100°C.	Process Piping,
Cupric Chloride	0-20% at 100°C.	Pumps, Valves,
Mercuric Chloride	All Conc. at 100°C.	Evaporators,
Aluminum Chloride	0-25% at 60°C.	Crystallizers,
Sodium Chloride	All Conc. at 100°C.	Kettles, Heat Exchangers
Sodium Hypochlorite	6% at 100°C.	Equipment for making bleaches
Chlorine Saturated Water	Room Temperature	Proportioning equipment
Wet Chlorine Gas	75°C.	Recovery equipment; electrolytic cells
Chromic Acid	10% and boiling	Plating equipment
Nitric Acid	0-70% at 100°C 60% at 195°C.	Acid Heaters, Nitrators and Auxiliaries
Sulphuric-Nitric Acid Mixture	40% sulphuric, 60% nitric at 35°C.	
Nitric-Adipic Mixtures	38% nitric—17% adipic at 90-95°C.	
ORGANIC CHEMICALS		
Chloroacetic Acid	100% at 100°C.	Chemical synthesis; equipment in manufacture of pharmaceuticals
Dichloroacetic Acid	100% at 100°C.	Chemical synthesis; equipment in manufacture of dyes

You can start your own evaluation tests now

As a pioneer *supplier* of titanium sponge, Du Pont can offer you expert technical help or put you in touch with manufacturers best equipped to work along with you. Considerable fabricating know-how and a wide variety of mill shapes are *now* available to help solve your corrosion problems. For more detailed information on titanium, just check the coupon below.



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REG. U. S. PAT. OFF.

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Pigments Department CE-3
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☐ Please send me your new technical bulletin on the corrosion-resistant properties of titanium.

☐ Please send me your general booklet on titanium.

I am interested in using titanium for:_____

*Name*_____

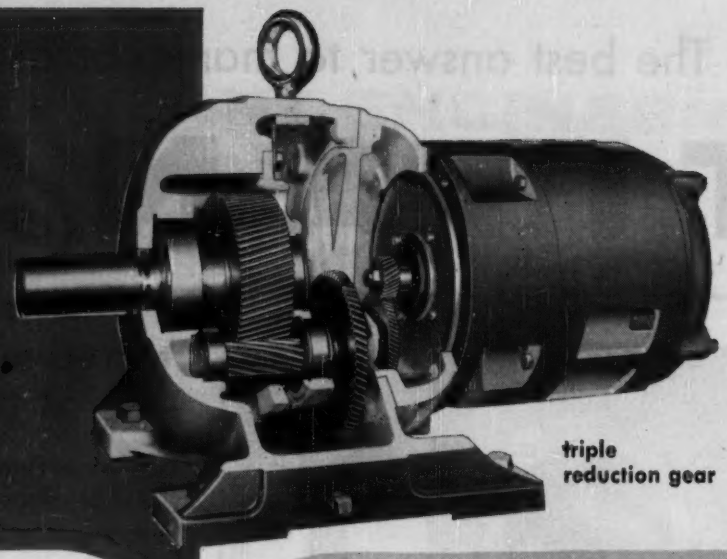
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triple reduction gear

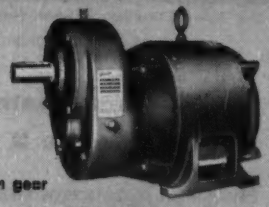
Here's

BUILT-IN SPEED... To Fit Your Need

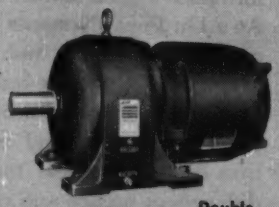
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Century Gearmotors

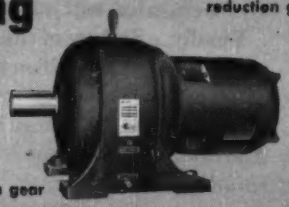
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Among recent developments are irregular shaped porous pellets, termed "Poly-surface." These provide improved adherence of catalyst, low pressure loss, and lowest density.

Because fluidized processes are becoming increasingly important, we have available small Poly-surface pellets that are individually porous. These absorb internally as well as externally, and expose the catalyst continuously, in spite of attrition.

Both the Poly-surface and symmetrical pellets are highly refractory and resistant to most acids. Their attrition loss is low. Porosity ranges from 20% to 60%; water absorption from 8% to 60% by weight. Bulk densities range from 30 to 92 lbs per cu ft.

A kit containing sample quantities of all our principal carriers is available. This is complete with technical literature and will be furnished free if request is made on company letterhead. (Otherwise only literature will be sent.) Please tell us if you are particularly interested in certain materials. Address: Dept. HH-35, Refractories Division, The Carborundum Company, Perth Amboy, N. J.



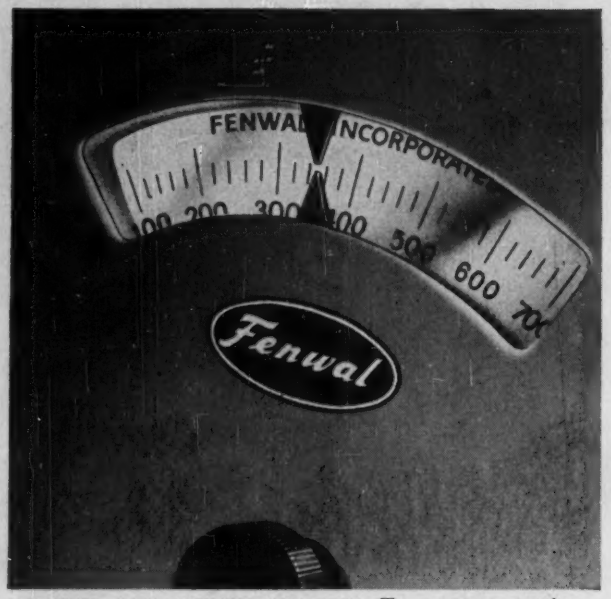
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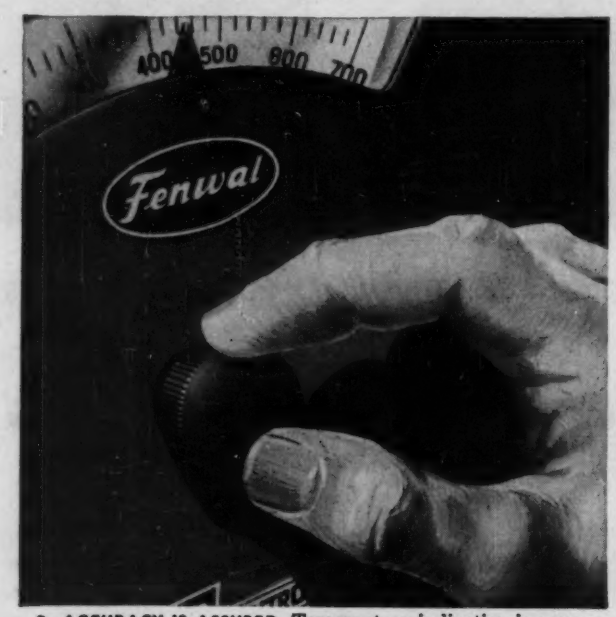
Now . . . a new Temperature Indicator-Controller by Fenwal



1. FENWAL'S NEW SERIES 540 is a remote Temperature Indicator-Controller that combines low cost with high accuracy over a temperature range of 100° to 700°F. Designed for ovens, packaging and processing equipment of all types, the new controller operates on a liquid-filled bulb and capillary system whose response to temperature changes is transmitted through a bellows to an indicating pointer. It may be flush-mounted or surface-mounted.



2. "SET" AND "CHECK" ARE EASY. Temperature setting pointer and bulb temperature pointer pivot on the same axis, indicating against the same scale face. This permits "glance" comparison of actual and set-point readings at considerable distance from the dial. An adjustable differential, variable between 0.8% and 4% of scale range, permits adjusting the operating bandwidth to balance closeness of control against slower cycling and longer equipment life.



3. ACCURACY IS ASSURED. Temperature indication is accurate to within 3% over the 100° to 700°F range, including the effects of ambient temperature in the range of 50° to 150°F. Accuracy increases for narrower ranges. Uniform control and accurate calibration are maintained with typical Fenwal precision in this new, popular-priced addition to a famous line of temperature control and detection devices.

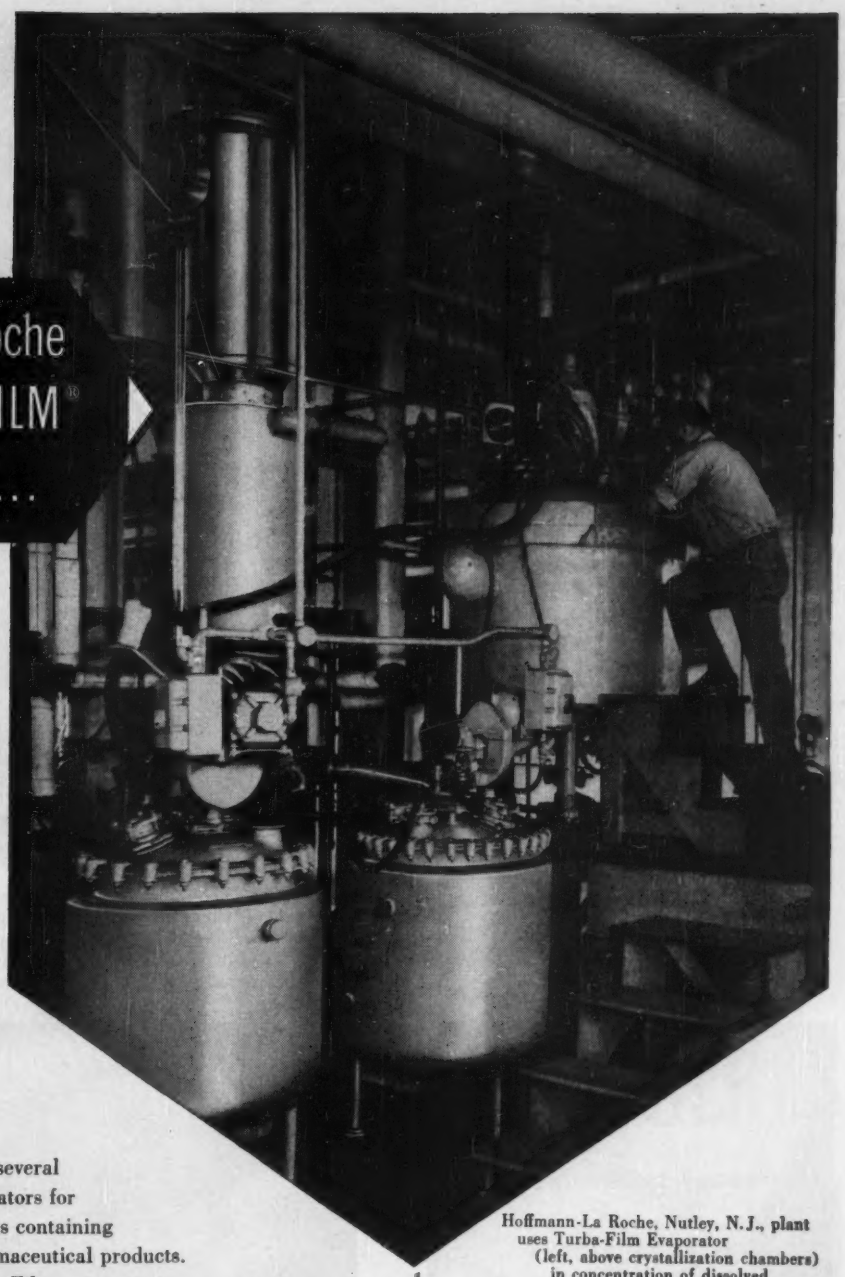


4. SEND FOR NEW BULLETIN. Get all the facts on how closely the new Series 540 meets your requirements for an economical, accurate indicator-controller. Write for comprehensive bulletin MC122. And remember, we're always ready to help in any problems concerning temperature control and detection. **Fenwal Incorporated, 163 Pleasant Street, Ashland, Mass.**

Fenwal Controls Temperatures ... *Precisely*

Hoffmann-La Roche uses TURBA-FILM® EVAPORATOR...

for Heat-sensitive substances



Hoffmann-La Roche, Nutley, N.J., plant uses Turba-Film Evaporator (left, above crystallization chambers) in concentration of dissolved heat-sensitive products

...and states,

"We have been using several Rodney Hunt Turba-Film evaporators for the concentration of solutions containing heat-sensitive pharmaceutical products. Due to special design, the Turba-Film evaporators show excellent performance and are superior to conventional evaporators. Evaporation takes place rapidly with only brief contact of the heat-sensitive material with the heating area.

Exposure to heat also is more uniform than in other evaporator designs, due to forced circulation in the form of an even film of liquid. Decomposition through overheating is avoided and the quality of the product, therefore, is excellent. Entrainment of product solution by the vapors is easily eliminated in the top separating section of the Turba-Film evaporators. Heat transfer efficiency is excellent."

When dry powders are required, Rodney Hunt Spray Dryers complete the process following Turba-Film Evaporators and produce fine powders or minute non-dusting globules.

Manufacturing Engineers Since 1840

RODNEY HUNT MACHINE CO.

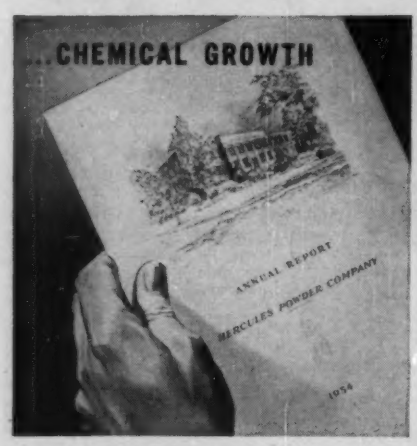
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OUR 1954 ANNUAL REPORT has recently been issued to stockholders. In it you will find convincing evidence of Hercules' growth and diversification. Copy sent on request.



FOR HIGH-SPEED PRINTING inks, resins made with Hercules PE (pentaerythritol) are becoming increasingly popular. PE makes possible resins with higher gloss, higher softening points, yet maintains desired solubilities, better aging characteristics, and shorter drying time necessary to keep pace with the press.

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Wedgeplug Valves are scientifically designed so that the plug is lifted from its protected seats, makes a full 90° turn, and is reseated—all in one simple, conventional operation. **No lubricants are needed to free the plug from the body seats, or to seal the plug from leaking after operation.** Dependable performance, at a wide range of temperatures and pressures, has made Wedgeplug Valves an international favorite. **Write for the Wedgeplug Catalog.**



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TYGON "ATD" Hot Spray PAINT

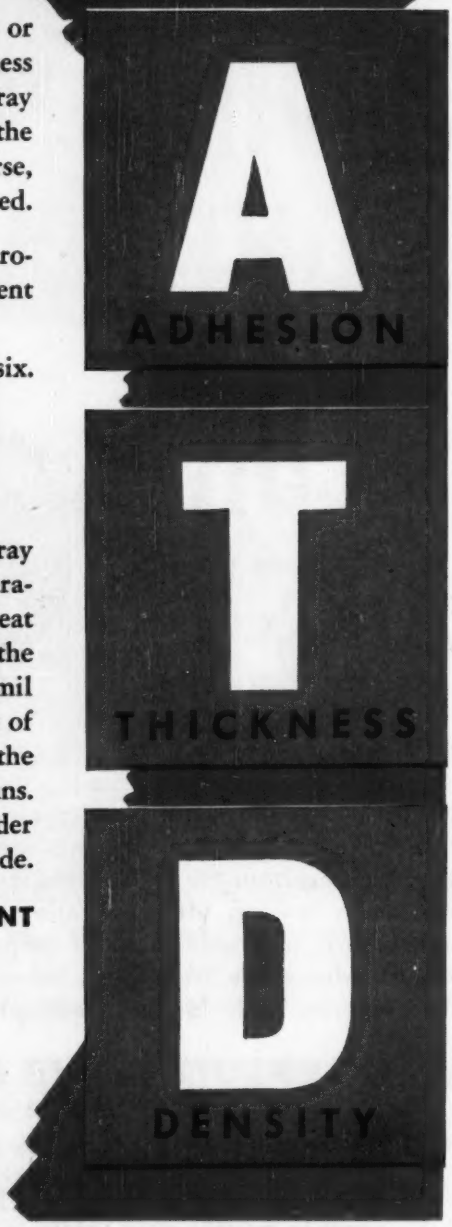
Tygon "ATD" Hot Spray Paint builds a film thickness of 3 mils or more at a single pass—5 mils or more in two coats—a film thickness that would require six or more coats of conventional cold spray vinyl paints. Adhesion is better. Film continuity (because of the thicker and denser film) is immeasurably improved. And, of course, the proven corrosion-resistance of Tygon Paint is in no way impaired.

Tygon "ATD" Hot Spray Paint offers the maintenance man and corrosion engineer a lower cost, surer way to protect plant and equipment against corrosive attack.

Lower cost— because two coats will do the job of five or six.
Lower cost— because no thinning is required.
Lower cost— because of less overspray.

HERE'S HOW IT WORKS—

Tygon "ATD" Hot Spray Paint is heated in a conventional hot spray heater to a temperature of approximately 160°F. At this temperature, the viscous Tygon "ATD" Hot Spray Paint becomes fluid. Heat does the work of thinners. As the hot paint leaves the gun, the solvents in the paint evaporate, and a high solids content, 3 mil thick protective coating is deposited on the target. Because most of the solvent has evaporated before the paint hits the target, the coating dries quickly. The finish is excellent, without sags or runs. The film is dense, free from pin holes, and resistant to a wider range of corrosives than any conventional protective coating made.



LEARN MORE ABOUT TYGON "ATD" HOT SPRAY PAINT

Write today for free literature and detailed information how you can use this lower cost, safer, and better "ATD" way to cut your corrosion losses. Address Dept. CE355.

U. S. STONEWARE

PLASTICS AND SYNTHETICS DIVISION • AKRON 9, OHIO 55E

Chementator

Edward T. Thompson

● Next volume product from Hercules Powder's phenol-from-cumene-type oxidation process will likely be p-cresol. Nothing sure yet, but cost estimates are complete on new unit for Gibbstown, N. J. Raw material would be p-cymene made from monocyclic terpenes.

● From its Buffalo ethylene plant, Semet-Solvay can now make up to 1,500 tons a year of crude (40-50%) butadiene byproduct, plus a 95% propylene stream. National Aniline will get most of the butadiene for tetrahydraphthalic anhydride, but some may be sold.

Solvent process gets sulfur from lean ore

Using a new solvent extraction method based on an old (1940) Standard Oil Development patent, American Sulphur and Refining Co. expects soon to be recovering 100 tons of refined sulfur daily from low-grade surface ores. Just-completed plant at Sulphurdale, Utah, cost $1.1 million.

SOD's patent claims use of a highly aromatic solvent, itself solvent-extracted from petroleum. At temperatures around 200 F. this type solvent takes up free sulfur; but when temperature is dropped to 70-80 F., most of the sulfur precipitates. American Sulphur says it's buying the required solvent, but won't reveal the source.

New source open for diammonium phosphate

For the first time, a coke oven operator is making diammonium phosphate: Colorado Fuel and Iron Corp. at Pueblo, Colo. It's not the high purity material used in food and feed supplements or in ammoniated toothpaste, but it has a fertilizer analysis of 21-53-0 and shouldn't have any trouble finding ready markets. CFI plans to sell all over the West under the tradename "DAP."

Instead of following the normal practice of scrubbing coke oven gas with sulfuric acid to yield ammonium sulphate—which is often a glut on the market—CFI now scrubs its gas with electric furnace phosphoric acid supplied by Monsanto. Only a few minor plant changes were needed, mostly in controls and acid handling facilities.

It's been known for a long time that DAP could be made this way. What's stopped coke oven plants from doing it was the lack of an inexpensive enough phosphoric acid that had the right qualities. Wet process phosphoric is cheap enough but contains iron and aluminum that at the temperatures used precipitate as hydroxide gels which give gumming troubles. Electric furnace acid, until very recently, just cost too much.

But the recent rash of new electric furnace plants has brought some excess acid supply. So some producers have started to make a less highly refined grade of acid, which though still quite pure can be sold for less—enough less to make DAP an attractive coke oven byproduct. And now that CFI has taken the initial plunge you can expect other coke and steel producers to latch onto this easy way to relieve ammonium sulfate headaches.

New era in sodium and caustic soda?

How would you like to be able to cut the factory production cost of metallic sodium from its present 9-11¢ a pound to about 3¢?

Or drop the factory cost of the sodium content in lead-sodium alloys (used to make tetraethyl lead) to less than 2¢.

Or make rayon-grade anhydrous caustic soda 15% cheaper than you can make liquid caustic in a mercury cell, in a plant that costs half as much?

Well, these are the prospects if the claims made for a new electrolytic cell just invented by

Chementator ® contents copyrighted under the general copyright on the March 1955 issue — Chemical Engineering, 330 W. 42nd St., New York 36, N. Y.

Joshua Szechtman can be substantiated. Right now the cell is still a paper development, but its concept is based on highly successful German work before and during World War II with fused-salt electrolysis in a molten-lead-cathode cell.

Even with very crude equipment, the Germans made lead-sodium alloy (10% sodium) for TEL on a tonage scale. And they achieved 15% higher current efficiencies than they'd been getting with diaphragm cells of the Downs type. Unfortunately, Russia now has the installation.

What Szechtman's done, fundamentally, is take a modern mercury cell design and substitute a thin stream of molten lead as the mobile cathode for electrolysis of fused salt. Lead-sodium alloy is made directly, with the sodium concentration controlled by adjusting the flow rate of lead and the current density.

When the alloy is to be used for TEL production, fresh molten lead will be added at the cell's upper end. Otherwise, sodium will be removed—by distillation or by a second electrolysis, whichever proves cheaper—and lead will be recycled.

To make caustic soda, you inject steam on the molten alloy, converting the contained sodium to anhydrous caustic. In this operation only, hydrogen is also recovered.

For all processes, the cell is continuously supplied with fused salt, and, of course, produces dry chlorine as coproduct. No salt purification is needed when making lead-sodium alloy for TEL. But when sodium or caustic soda is desired, the salt is purified before entering the cell.

Plans now are to build a pilot plant this year, financed by granting options for one exclusive license or a limited number of nonexclusive licenses to interested firms. Szechtman, a leading authority on mercury cells, and his associates expect to form a development company soon. Until then, negotiations are being conducted through William H. Friend of Amroc, Inc., New York City.

First use of new methyl styrene process

American Cyanamid will soon be turning out its first thermoplastic molding compounds. Two new plants are being built, both to use new, Cyanamid-developed processes. The molding compounds —up to 40 million lb. annually—will be made only at Wallingford. Conn. But all the principal intermediate material—methyl styrene (also called vinyl toluene)—will come from Fortier, La., site of several of the firm's petrochemical units.

It's the Fortier plant that holds the most interest, processwise. For it will mark the first commercial use of the diarylethane process that Cyanamid's been working on for several years.

Rather than ethylate toluene directly (as Dow does at its Midland, Mich., vinyl toluene plant), Cyanamid will react toluene with acetylene to yield ditolylethanes. This mixture will then be catalytically cracked to *o*- and *p*-methyl styrenes, which are good for thermoplastic moldings, and toluene. Dow's process gives meta and para isomers for surface coating applications.

One probable reason for Cyanamid's using this more complex process is that it can also be used to make dimethyl styrenes—also for thermoplastic moldings—by charging xylenes instead of toluene. In this operation it's also desirable to use acetaldehyde rather than acetylene for best isomer distribution. And because *o*- and *m*-xylenes are more reactive in forming dixylylethanes in the initial reaction, *p*-xylene concentration builds up and this valuable product can be recovered, too.

Who's getting our new engineers?

Latest estimate of this year's engineering graduates indicate that of nearly 20,000 B. S. engineering degrees to be awarded in 1955 by accredited schools, about 10% will be chemical engineers. But how many will be available to industry?

Roughly half the 20,000 will go directly into the Armed Forces from ROTC programs. Another big group will be grabbed by the draft.

Recently, the Engineers Joint Council and the Scientific Manpower Commission had this to say on the problem:

"In the face of a surplus of physically fit . . . and in the teeth of an impending drop of 50% in induction calls, Selective Service is again arbitrarily drawing 8-10% of the monthly induction requirements from essential and irreplaceable personnel in industry and from students who have entered upon graduate specialities."

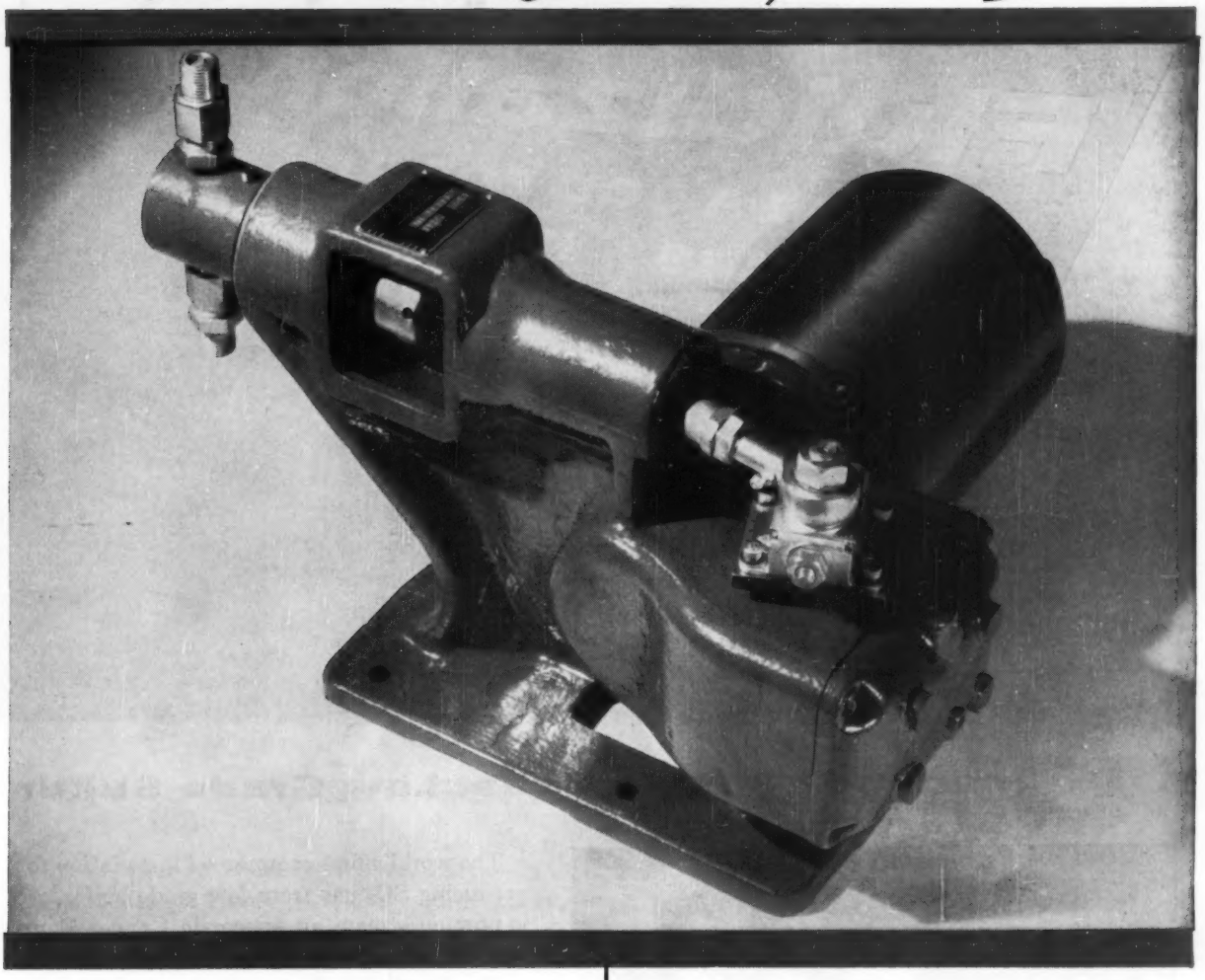
Further, the two groups asked the question: What's happened to the recommendations made last year in the Appley report on Manpower Resources? This report warned that the margin of skilled manpower for expanding war production is extremely narrow and that stripping industry of big numbers of these persons imperils the nation.

Government interest in the Appley report has certainly not been vocal. And it's not likely that the President or the Cabinet will take action soon. They're concerned over reports of Russian technological and education advances (2½ times more

(Continued on page 106)

Look!





NEW CHEMICAL PROPORTIONING PUMP

More pump for less money!!! Write for prices, capacities, and specifications on the new Proportioneers Model 1105-KH. Proportioneers, Inc., 369 Harris Ave., Providence 1, Rhode Island.

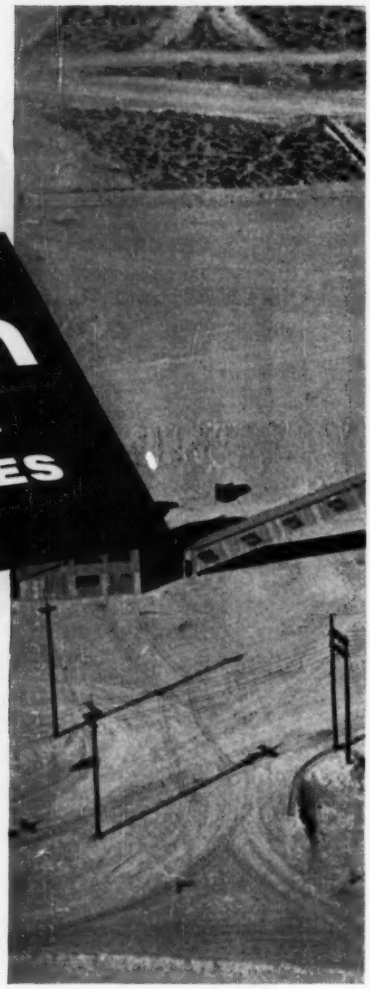
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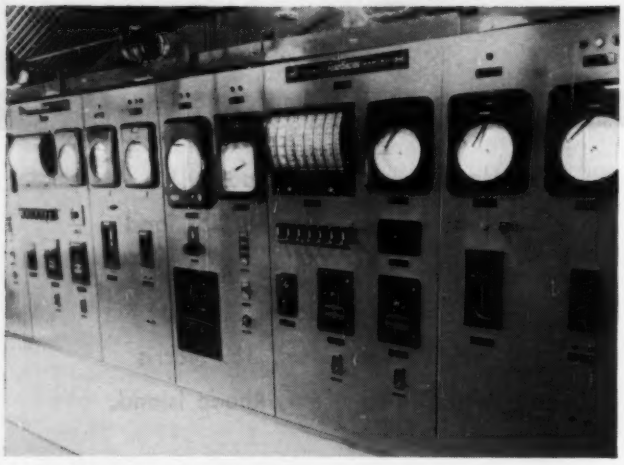
Aerial view of acid section at Weed Heights, Nevada. FluoSolids System is in foreground . . . contact acid plant in right rear.

Fluidization

NEW TOOL FOR THE PROCESS INDUSTRIES

You've heard a lot about fluidization in the last ten years and the changes it has brought about in the petroleum industry. But did you know that new applications for fluid bed techniques are still turning up in many non-catalytic fields as well? A good case in point is the installation shown on these pages.

Anaconda First to Roast Low Grade Sulfur

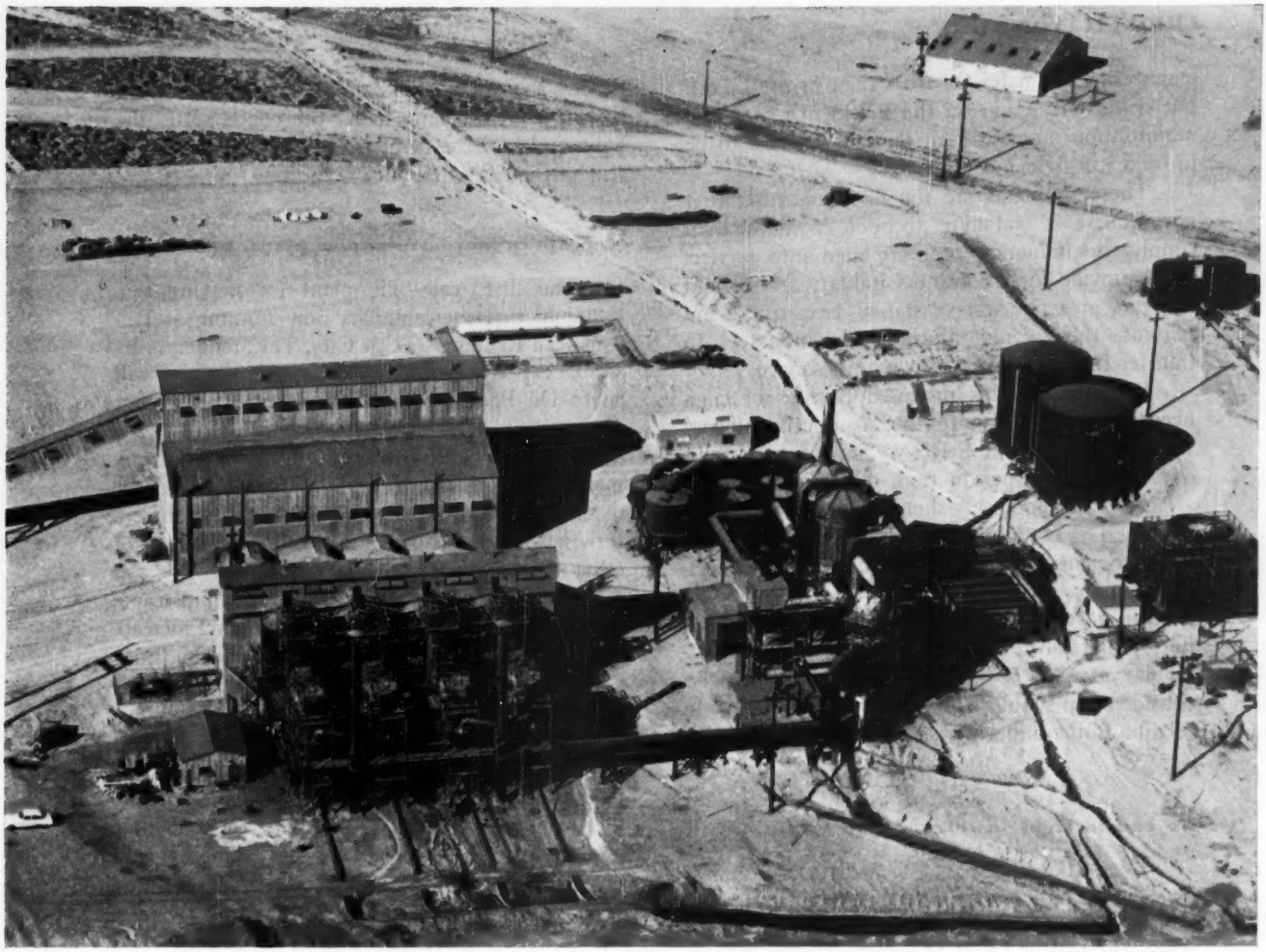


This completely instrumented FluoSolids control panel gives a graphic picture of the entire operation.

The world's first commercial installation for producing SO_2 gas from low grade sulfur ore is now on stream at Anaconda Copper Company's plant at Weed Heights, Nevada.

The FluoSolids System that makes this possible includes four 18 ft. dia. Reactors plus other Dorr-Oliver equipment and auxiliaries. SO_2 gas is sent to a 450 TPD contact acid plant which supplies all acid requirements for leaching 11,000 tons of copper ore per day.

Feed to the system is 650 to 750 tons per day and gas production 26,000 to 30,000 C.F.M. Gas strength averages 8 to 12% representing a sulfur recovery of 98%. Unusual? Yes, because this is the first time that low



Ore to Produce SO_2 for Acid Manufacture

grade sulfur ore could be recovered as SO_2 . . . economically. Here's how the system works . . . ore averaging 28% total sulfur is crushed to 10 mesh and fed dry to the Reactors which operate in parallel. Once ignition temperature is reached no extraneous fuel is needed. Ore is simply fed in at the design rate, latent heat in the bed immediately brings it to ignition temperature, and the fluidizing air oxidizes the sulfur to SO_2. Shutting down is a matter of minutes. And because the fluid bed stores sufficient heat, roasting can be started again after as much as 72 hours without adding additional fuel.

For Further Information – Chances are you don't need 450 tons of sulfuric acid a day. But if there's a step in your flowsheet where intimate contact between solids and gases is essential, fluidization should be investigated. As licensee in all non-catalytic, non-hydrocarbon fields, Dorr-Oliver has continually expanded the applications of this new technique since 1944. We will be glad to work with your research and development department, run pilot plant tests at our Westport Laboratories, or cooperate in any other way necessary to insure a realistic evaluation of fluidization in terms of your process. Just drop a line to Dorr-Oliver Incorporated, Stamford, Conn., or in Canada, 26 St. Clair Ave. East, Toronto 5. No obligation of course.

FluoSolids is a trademark of Dorr-Oliver Incorporated. Reg. U. S. Pat. Off.

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engineering graduates this year than in the U. S.), but will await action on the President's proposed mobilization program even though it seems to be in for a stiff fight in Congress.

These proposals are the first indication that government is watching technology more than simply the induction of every man into service. They provide for six months military service and 9½ years in active reserve status. Even more important, they would allow certain inductees to transfer from two-year to six-month service.

Significantly, this proposed transfer of engineers and scientists into the six-month category would take heat off Selective Service because it doesn't relieve a person from all military service.

Not that engineers should be exempted completely. Dr. H. A. Meyerhoff, Executive Director of the Scientific Manpower Commission believes, for example, that every man should put in some time in government service for the country's military protection. But he doesn't believe it has to involve carrying a gun. For maximum benefit, consideration should be given to special abilities in relation to the military program.

No end in sight in tetracycline battle

Even though Chas. Pfizer & Co. has just received the only process patent on the manufacture of tetracycline (U. S. 2,699,054) and has licensed American Cyanamid under it, the firm's ultimate market position is still obscure. For Bristol Laboratories and its two tetracycline distributors, Squibb and Upjohn, refuse to concede defeat.

Pfizer's new patent covers the manufacture, use and sale of tetracycline—a broad spectrum antibiotic—and its salts. Both Cyanamid and Bristol were also trying for such a patent. But Cyanamid and Pfizer agreed that if either did get a patent, the other would license it.

Bristol, on the other hand, chose to go it alone and will keep right on trying to patent its fermentation process, without production letup. Squibb and Upjohn have also reaffirmed their intentions to keep selling the drug under their own tradenames.

Further complicating the situation has been a just-settled suit filed last September against Bristol by Cyanamid. This charged infringement of Cyanamid's patent on the production of chlorotetracycline (Aureomycin). Though Bristol denied this allegation at first, it has now tacity admitted it by agreeing to pay royalties to Cyanamid on both past and future use of the process.

Unimpressed by this settlement, Pfizer is continuing its suit (filed the day the new patent was issued) against Bristol, Squibb and Upjohn. All seem perfectly willing to let the courts settle the fight, and how the tangle will be resolved finally is still anybody's guess.

Mercaptan movements: new plant, new owner

The first really big plant for making synthetic methyl mercaptan is now running at Pan American Refining's Texas City, Tex., refinery. Its annual capacity is 5 million lb., much of which will go to Du Pont's methionine plant in Beaumont, Tex.

Methanol and hydrogen sulfide are the raw materials for this process. Some of these will be made at the Pan Am refinery, the rest purchased. Provisions are also being made for production of ethyl mercaptan and possibly others.

Coincident with the startup of this unit came word that the only other synthetic methyl mercaptan plant—a small one completed last year by Index Chemical near Houston—has essentially changed ownership. PennSalt, new majority owner of Index, will integrate the plant's operations with those of its own Sharples Chemicals subsidiary. Plans are to up both volume and variety of chemicals made in the Houston plant. At present these include methyl and ethyl mercaptans, plus dimethyl and diethyl sulfides.

Making big ones from little ones

Mergers are still making important news in the chemical process industries. The growing parade of company fusions that marked 1954 shows no signs of slackening this year. Recently, these two consolidations hit the headlines:

• Hooker Electrochemical Co., Buffalo, is negotiating with Durez Plastics & Chemicals, Inc., of North Tonawanda, N. Y. Durez stock outstanding would be traded for Hooker stock on a share-for-share basis.

• Directors of Mid-Continent Petroleum Co. and Sunray Oil Corp., both of Tulsa, have agreed on merger plans. The name of the new firm, if the move goes through, will be Sunray Mid-Continent Oil Co.

Significance of the proposed Hooker-Durez combine would be to put Hooker a lot further into the plastics field. (It already makes some polyester and fluorine-based resins.) Durez, whose sales last year totaled about $20 million, is an important producer of phenolic resins and plastics, makes its

(Continued on page 108)

First H_2SO_4 ... by General Chemical, the nation's primary producer of Sulfuric Acid.

then SO_3 ... by General Chemical, the country's sole source of Stabilized Sulfur Trioxide

...Now SO_2 by General Chemical

LIQUID SULFUR DIOXIDE

WITH THE ADDITION of Sulfur Dioxide to its extensive line of basic chemicals, General Chemical now becomes industry's *sole source* of all three key "sulfur" chemicals.

TO THE MANUFACTURE of SO_2, General brings its tremendous knowledge of sulfur chemistry, gained as America's pioneer producer of Sulfuric Acid by the contact process and as the only producer of "Sulfan"*—Stabilized Sulfur Trioxide.

THIS MANUFACTURING and technical background is reflected in the extremely high purity of General's Sulfur Dioxide which assays 99.9% SO_2 . . . and stands as your guarantee of another of the many first-rate "GC" Basic Chemicals for American Industry.

IF YOU ARE READY to place an order for your current SO_2 *tonnage* requirements, call in General—the company that is known throughout the country as first for Sulfuric Acid and related chemicals. Just phone or write any of the 27 General Chemical offices listed below for full information.

Packaging

1 Ton Containers
Multi-Unit Cars (15 one-ton cylinders)
Single Unit Tank Cars (18 and 36 Tons)

Specifications

Assay	99.9% SO_2
Molecular Weight	64.06
Melting Point	−103.9°F (−75.5°C)
Boiling Point	14.0°F (−10.0°C)
Specific Gravity	1.363 at 80°F
Critical Temperature	314.82°F (157.12°C)
Critical Pressure	1141.5 p.s.i.a.

Typical Uses of SO_2

Preparation of hydrosulfites, sulfoxylates and other chemicals; as a bleaching agent in textile, paper, clay and leather industries; refrigerant; as an antichlor for use in water treatment, textiles, paper and other plants where chlorine has been used; in the processing and preserving of food products; in petroleum refining; for treatment of chromium waste liquors.

*Reg. U.S. Pat. Off.

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In Wisconsin: General Chemical Company, Inc., Milwaukee
In Canada: The Nichols Chemical Company, Ltd. • Montreal • Toronto • Vancouver

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own phenol and formaldehyde. Hooker, of course, did most of its $44 million business last year in chlorine and caustic soda. But in addition, its specialty sales—chemicals for such things as insecticides and oil additives—are on the rise.

Merger of Mid-Continent and Sunray would result in a well-integrated company with gross income of over $300 million. Sunray, though it does run a 25,000 bpd. refinery in Duncan, Okla., is best known as a crude oil producer (25.5 million bbl. in 1953, plus 80 billion cu. ft. of natural gas). Mid-Continent, conversely, produces little crude, but operates a 55,000 bpd. refinery near Tulsa and markets its "D-X" brand over a wide area in the Southwest and Midwest. So the two operations are highly complementary in nature, and a merger should have many advantages.

Another oxo user starts up

Following extended trial runs, Standard Oil (Ind.) has started commercial production of iso-octyl alcohol via the oxo process at a new 10-million-lb.-a-year plant at Wood River, Ill. Thus the firm becomes the third in the U. S.—behind Esso and Gulf—to use the process.

Like Gulf, and presumably Esso, (*Chem. Eng.*, Aug. 1954, p. 113) Standard starts with a purified heptene stream made by catalytic polymerization of refinery gas at high pressure. These heptenes are reacted with hydrogen and carbon monoxide over a cobalt catalyst at 300-400 F. and 3,000 psi. to yield octyl aldehydes—one more carbon than the charge. Purification and further reaction with hydrogen give the alcohol. In all, six catalyst are used.

Main uses of iso-octyl alcohol are in making vinyl resin plasticizers, weed and brush killers and synthetic lubricants for jet aircraft. Standard also plans to make other high boiling alcohols at Wood River in the future.

AEC spells out atomic power plans

In February, Atomic Energy Commission officials began unveiling in detail their plans for letting private interests take over the job of putting atomic power on the market.

These plans have been shaping up since Congress last year passed a comprehensive revision of the Atomic Energy Act of 1946. The new law provides for many aids to industry's learning how the atom works, and allows private firms to get necessary fuel and equipment.

Last month the agency drew up a price list for the fuels it will lend to power reactors. It also decided what to pay for weapons material provided by licensees. In addition, AEC has:

- Eased security regulations so interested business men won't have to get a full FBI check.
- Said it will help pay for getting good reactors off drawing boards and into operation.
- Planned ways of giving out information and fuel, keeping cost low to boost participation.

But there are still knotty problems. Government must decide, for example, what security's required to store borrowed documents and materials—24-hour guard? For tight restrictions could make cost of getting and keeping information and materials prohibitive.

To give those who want in on the program a chance to see what's offered, AEC will hold several roundtable discussions. And much of what's still in the planning stages will be publicized in the current hearings before the Joint Committee on Atomic Energy, which began Jan. 31.

Tried gamma radiation yet? Lots have!

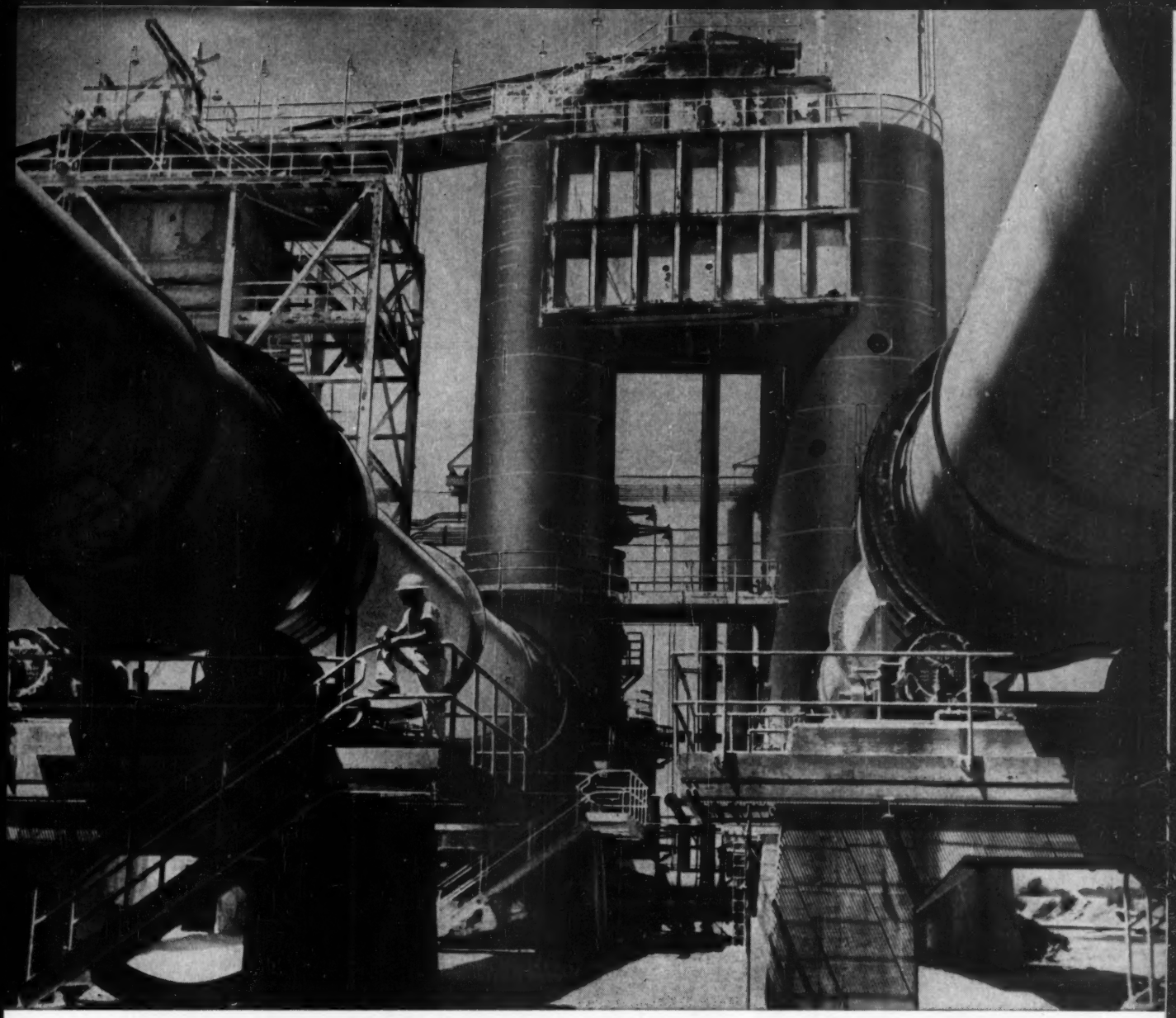
A long-expected move toward activating chemical reactions with gamma rays seems definitely to be gaining momentum.

Most dramatic development in the field recently was in the Air Force's disclosure that it has successfully vulcanized rubber with gamma radiation at its Wright Air Development Center near Dayton, Ohio. How competitive the process can be is still a big unknown, but elimination of both heat and vulcanizing agents are two big points in its favor. Best potentials, say spokesmen, now appear to be in producing high-temperature oil-resistant rubber compounds and in improving low-temperature serviceability of rubber.

But industry's not taking a back seat to government in this work. Standard Oil Development's decision to build a special lab to study radiation-activated reactions (Chementator, Jan. 1955, p. 99) was quickly emulated by both Diamond Alkali and Battelle Memorial Institute. Also, Stanford Research Institute has added another 2,000-curie source, doubling its facilities.

Diamond's new lab (at Painesville, Ohio) will use a 1,000-curie source to study such reactions as polymerization, chlorination and oxidation. And Battelle says its 2,000-curie source is now available to industry for contract studies. Housing for this installation is big enough for 10,000 curies, a strong indication that gamma radiation studies are expected to go big in the next few years.

For more of WHAT'S HAPPENING 110



Mathieson Soda Ash: *there's always an 'r' in purity*

Purity knows no season in the production of Mathieson soda ash; oyster *shells* are available every month of the year. Here at Lake Charles, La., shells are the starting point of the ammonia-soda process. Taken from the Gulf by the thousands of tons, they are washed and placed in huge storage piles, then transferred as needed to the towering silos shown above. From the silos they are fed into large rotary kilns where carbon dioxide and lime of extremely high purity are obtained.

At *all* Mathieson plants, attention to raw materials helps assure the quality of products. In addition, buyers have the protection of multi-plant production facilities . . . 6 caustic soda plants, 5 chlorine plants, 7 sulphuric acid plants, 3 ammonia plants . . . plus practical technical assistance with materials handling and application problems.

When planning current or future chemical requirements, be sure to call on Olin Mathieson. Perhaps you can buy to better advantage from one of America's largest, most diversified producers of basic industrial chemicals.

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CAUSTIC SODA • SODA ASH • CHLORINE • SULPHURIC ACID • SULPHUR • AMMONIA • NITRATE OF SODA • BICARBONATE OF SODA • CARBON DIOXIDE • SODIUM CHLORITE • CALCIUM HYPOCHLORITE
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MARCH
1955

What's Happening

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Low-Grade Ores Yield Commercial Sulfuric Acid

Fluidized solids techniques are now being used to recover sulfur (as SO_2 and subsequently as sulfuric acid) from low-grade sulfide ores. The process, called the FluoSolids system, was developed by the Dorr Co. of Stamford, Conn., and has been in operation for over a year at the Yerrington, Nev., plant of Anaconda Copper Co. First operating details were revealed at a recent A.I.Ch.E. meeting in New York.

At the Yerrington plant, raw ore is roasted at about 1,200 F. in four cylindrical reactors—25-ft. high and 18-ft. inside diameter. With a 5-ft. bed depth, detention time in the reactor is about 5½ hours.

Gas from the FluoSolids system is cooled to 800 F. by 20 high-pressure water sprays. Cyclones then removed 92% of the entrained solids. The gas is further cleaned, cooled to 100 F. in a wet scrubber, and goes to an acid plant.

Anaconda's daily throughput since Oct. 1953 has averaged 650 tons of ore and 450 tons of sulfuric acid.

How the Two Plants Compare

	Deere	Grace
Production capacity, ton/day		
Ammonia	180	250
Urea	275	150
Products for sale, ton/day		
Ammonia	none	150
Fertilizer and feed grade urea	275	150
Technical grade urea	none	
Total plant cost, $ millions	18	22

Pechiney Urea Makes Its Bow

Two new plants—at Pryor, Okla., and Memphis, Tenn.—use Texaco partial oxidation of natural gas, Casale ammonia and carbamate-recycle urea processes.

If engineers of Foster Wheeler's Process Plants Division are walking around these days with their heads in the air, there's a good reason.

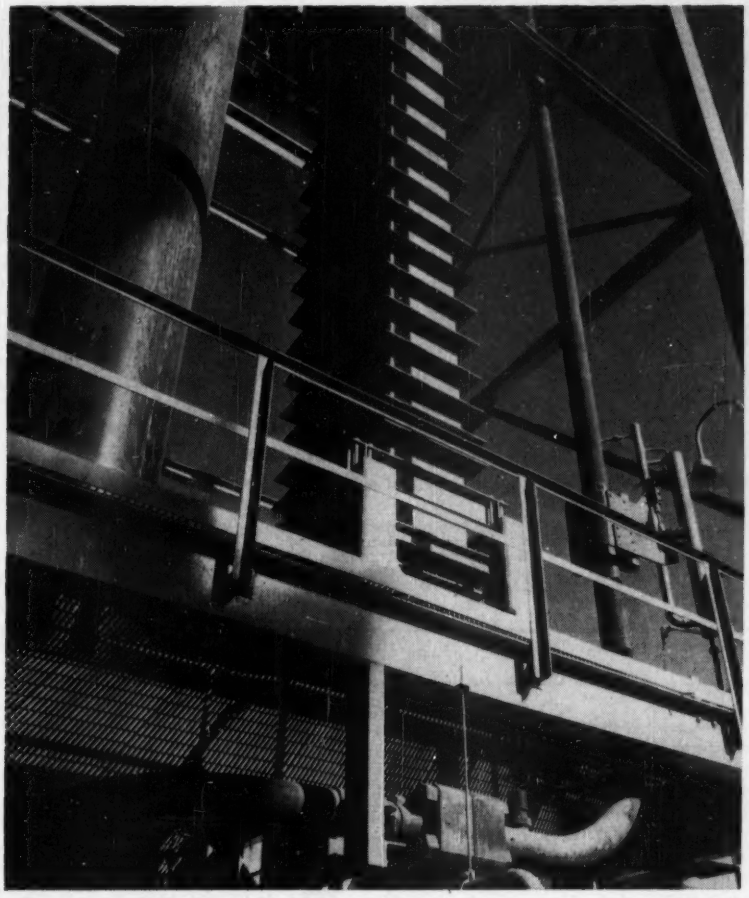
Actually, there are two good reasons—the two new ammonia-urea plants recently put on stream by John Deere & Co. at Pryor, Okla., and Grace Chemical Co. at Memphis, Tenn.

With these two plants the Pechiney urea process makes its American debut on a grand scale—275 tons a day for Deere and 150 for Grace. Total investment for the two plants comes to about $40 million.

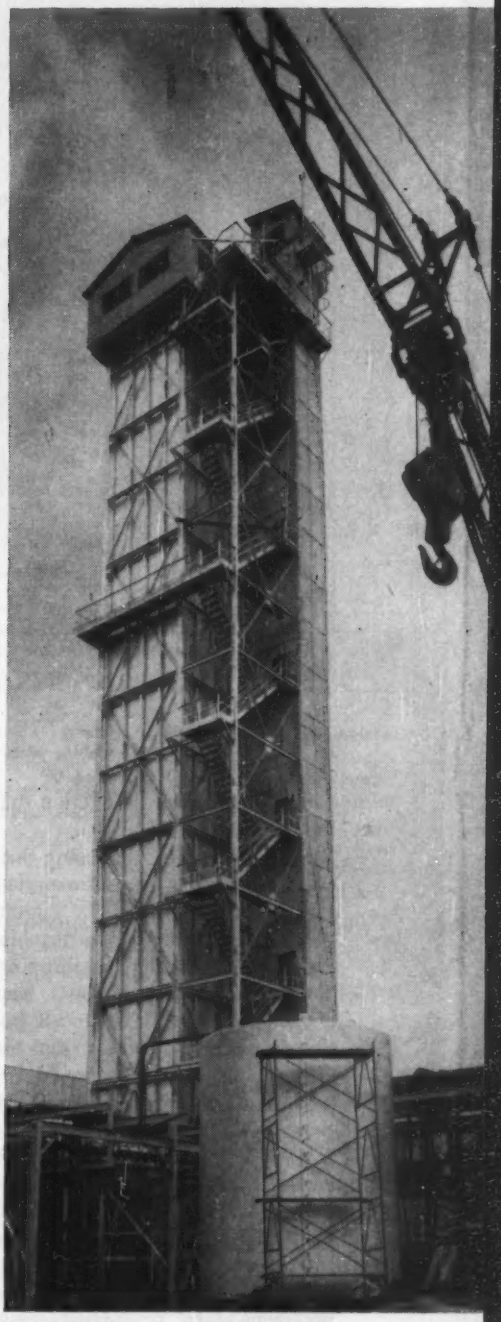
► **Combination of Processes**—Both plants use the same combination of processes, engineered by Foster Wheeler Corp., New York. These processes are:

- Partial oxidation of natural gas to make ammonia synthesis gas —the Texaco process.
- Ammonia synthesis at 9,000 to 12,000 psi.—the Casale process.
- Urea synthesis with carba-

in Chemical Engineering



AMMONIA converter and condenser, with recycle ejector below (Deere plant).



UREA prilling tower (Grace plant).

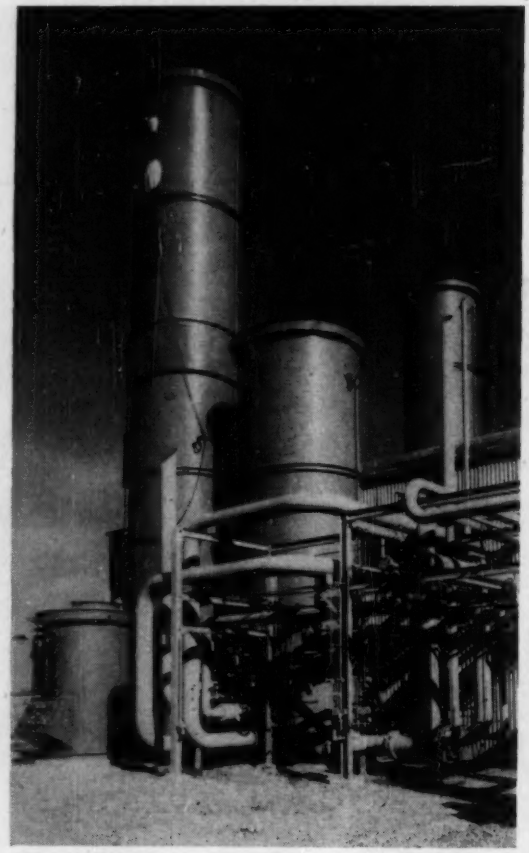
mate-oil slurry recycle—the Pechiney process.

Major process difference between the two plants is that Grace can produce crystalline (plastics grade) urea, as well as fertilizer grade, by adding certain chemical purification steps. Alternatively, Grace's urea production, like Deere's, is prilled for fertilizer and cattle feed markets.

Another difference, also related to markets, is that Deere converts all its 180 tons per day of ammonia to urea, while Grace will have as much as 150 tons of its 250 daily tons of ammonia for marketing as such.

▶ **Deere Is First** – Although engineering and construction of both plants proceeded concurrently, Deere was the first to sign a contract and first to get on stream, starting ammonia production last August and urea in November. Grace shipped its first car of ammonia in December, started up its urea operation in February, ex-

For Air-Separation Units, Parting of the Ways



Chief engineering difference between the Grace and Deere ammonia plants is in the air-separation units. Grace uses a single unit rated at 200 tons per day of oxygen, supplied by Air Products, Inc. Deere has two 80-ton units, supplied by American Messer Corp.* (see cut).

Air Products says that the Grace job is the largest high-pressure oxygen plant ever built. Costing about $1 million, exclusive of primary air compressor, it was assembled at the plant site after fabrication of sections at Air Products' plant at Emmaus, Pa.

The Messer units were completely prefabricated—including internal piping—at Frankfurt, Germany, and shipped as packaged units. Installation at the Deere plant required merely that they be set in place and connected to the primary compressor and service lines. Cost: $650,000.

Both units pump oxygen as a liquid at 400 psi. to the synthesis gas reactors, rather than transfer oxygen in the gas phase. Messer uses a reciprocating pump, Air Products a centrifugal pump.

Grace says that its choice of oxygen unit was influenced largely by the more ready availability of American-built equipment, not by any anticipated difference in performance. Although Messer maintains a U.S. supply of repair parts, Deere evidently figured that having two parallel units provides an added margin of safety in case of equipment outage.

*To complete the record, the two earlier partial-oxidation ammonia plants showed the same independence—Spencer bought from Air Products and Cooperative Farm Chemical Associates from Messer.

pects to be in full production during March.

Both companies are making their first entree into chemical manufacturing. John Deere is a famous name in the field of farm machinery, Grace in trading and shipping. True, other Grace interests have been concerned with chemicals, but this is the first plant under the Grace Chemical Co. name.

▶ **Synthesis Gas Preparation** – Although Grace and Deere aren't the first on stream with the Texaco partial oxidation process for making ammonia synthesis gas, their plants are nonetheless pioneer ventures, since the first user–Spencer Chemical at Vicksburg, Miss.–had not gone into production when Deere and Grace signed their contracts.*

Natural gas is reacted with oxygen at 350-400 psi. to produce a mixture of hydrogen and carbon monoxide. The reaction, which is noncatalytic, takes place at over 2,000 F.

Further catalytic reaction with steam at 300 psi. and 750 F. converts practically all the CO to CO_2, with simultaneous generation of more hydrogen. CO_2 is removed by absorption in monoethanolamine and caustic soda; final purification of the hydrogen is done by washing with liquid nitrogen at 300 psi. and −300 F. to remove traces of CO, methane, oxygen and argon.

Air-separation units supply oxygen for the synthesis gas reaction and nitrogen for scrubbing and make-up of the hydrogen-nitrogen mixture for ammonia synthesis (see box).

▶ **Ammonia Synthesis**–Unique feature of the Casale ammonia process is the use of an inexpensive ejector, instead of a costly mechanical compressor, to recirculate unconverted hydrogen and nitrogen through the converter. In addition to reducing first cost and maintenance expense, the ejector also eliminates oil contamination of the circulating gases.

Operating pressures are substan-

*Spencer started its partial oxidation unit in January 1954; Cooperative Farm Chemical Associates, Lawrence, Kan., went on stream in December, about the same time as did Grace.

Technical data on the revolutionary new

holo-flite*

(HOLLOW-FLIGHT)

PROCESSOR

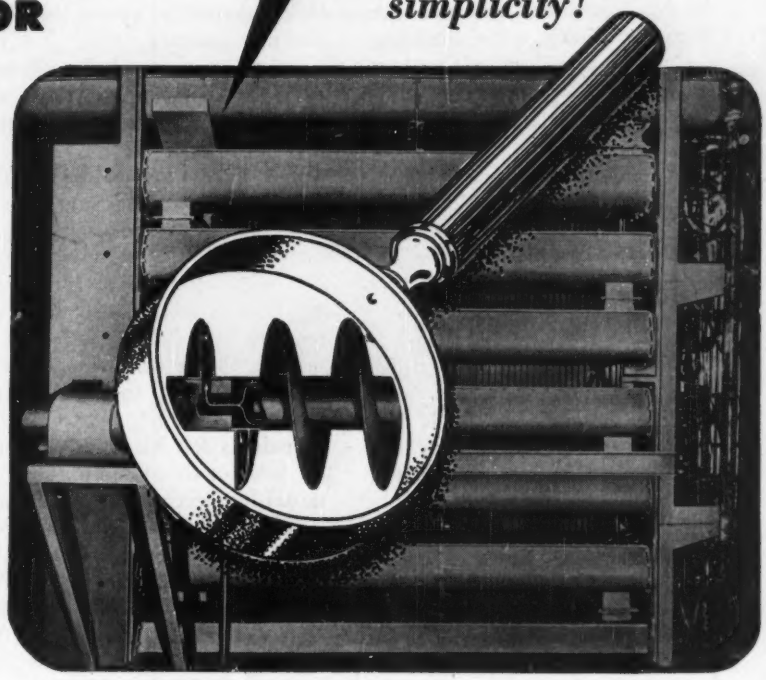
—the Continuous-Flow Heat-Exchanger that is setting new standards of *compactness! adaptability! simplicity!*

If you have processing operations where slurries, solids, pulps or pastes must be cooled or cooked, be sure to investigate the many unique advantages of the newly-developed HOLO-FLITE Processor before you install *any* heat-exchange equipment.

Here's the HOLO-FLITE principle . . .

Two or more screw conveyors rotate slowly in a trough. The blades and shaft of each flight of conveyors are hollow, with provision for circulating the heat-transfer agent through them. The product to be cooled or cooked is moved along the trough, being constantly rotated into, around, over and under the conveyor screws as it moves.

Thus, a continuous thermal transfer takes place between the product and the heat-transfer fluid circulating in the blades. The product is cooled or cooked in *continuous-flow* without the "stop-and-go" losses of batching operations . . . and cooled products can be packaged directly from the HOLO-FLITE discharge—saving space, time and additional handling.



THIS 6-TIER HOLO-FLITE cools 7 tons of cottonseed press cake per hour from 285° to 89°F. *in a total floor space of only 28 sq. ft.* *(Inset)* Enlarged cutaway view of HOLO-FLITE screw showing heat-transfer principle.

Here are typical HOLO-FLITE advantages

The HOLO-FLITE principle is so unique it is setting completely new standards of performance in *many* ways. For example . . .

*Reg. T.M.

The HOLO-FLITE Saves Space—It requires as little as 1/5th the space of other units of comparable capacity because (1) it has far greater heat-transfer area per cubic foot of space . . . and (2) the flights can be "tiered" as high as desired to give maximum capacity in very small floor areas.

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tially higher than most other ammonia processes. According to Foster Wheeler, high pressure gives greater tolerance of catalyst for contaminants (oxygen and CO) in the synthesis gas. Another advantage: Anhydrous ammonia can be condensed from the converter gas stream by 85-deg. water, obviating the need for auxiliary refrigeration equipment.

Departing from convention, Foster Wheeler is basing its converter design, where economics so dictate, on welded instead of forged steel construction. Converters at both Deere and Grace plants were made by A. O. Smith Corp.'s multilayer welding technique.

Deere uses two "trains" rated at 90 tons each; Grace has three, rated at 83⅓ tons each. Foster Wheeler figures that Casale ammonia trains of as much as 170 tons per day capacity are practical in some cases.

Although Deere and Grace are second and fourth in the U. S. with Foster Wheeler-Casale units (Penn Salt at Wyandotte, Mich., and Cooperative Farm Chemicals Associates were first and third), the process is used extensively throughout the rest of the world, with more than 40 units making over 5,000 tons of ammonia per day.

▶ **Urea Manufacture**—Reaction of ammonia with carbon dioxide (recovered from the synthesis-gas absorption system) at a pressure of 3,000 psi. and a temperature of about 350 F. forms ammonium carbamate, about 60% of which changes to urea, with the formation of water. When the reaction mixture is released to a lower pressure —about 80 psi.—the unconverted carbamate decomposes into ammonia and CO_2.

In the Pechiney process, this ammonia-CO_2 off-gas is contacted with a mineral oil in a specially designed vessel known as the salt-oil reactor. The Grace version is a horizontal vessel, about 7 ft. dia. and 25 ft. long, equipped with seven horizontal side-entering shafts on which are mounted "a multiplicity" of vertical disks. Function of the spinning disks is to atomize the oil in the mixed-gas atmosphere.

In this reactor, the gases recombine to form ammonium carbamate as a finely dispersed solid slurried in the oil. This slurry (35-40% solids) is returned to the synthesis reactor, accompanied by the feed of fresh ammonia and CO_2. This recycle scheme is unique for the Pechiney process.

Other functions of the oil, besides providing a means for recycling unconverted carbamate, are:

- It coats the lead-lined walls of the autoclave and reduces metallic contamination from corrosion.
- It absorbs heat in the reactor, helps control and maintain uniform temperature. This heat is rejected by cooling the recycle slurry on its way to the synthesis reactor.

▶ **Products and Markets**—Urea can be used for direct fertilization, in mixed fertilizers and as a nitrogen supplement in cattle feed. Product for these uses is evaporated to a molten, anhydrous condition, then prilled in a tall tower (over-all height of prilling tower is 200 ft. above grade). Fertilizer grade and feed grade differ in particle size range; fertilizer particles are larger, to avoid dusting losses, and feed particles are smaller, to avoid segregation in the feeding trough.

High-purity urea, for use in chemicals and plastics, is produced by Grace in another finishing line, which can handle the entire urea output. Impurities, such as iron traces, are removed by adsorption or precipitation with suitable reagents followed by filtration. Final steps are vacuum crystallization, centrifuging, drying in a rotary kiln and bagging.

Foster Wheeler thinks that contaminants in the fertilizer grade product may actually turn out to be so low as to make this product acceptable for chemical use. This is based on the premise that metal pickup—most of the equipment is made of aluminum or stainless steel —will be minimized in these large plants, where surface-volume ratios are much lower than in the 5-ton-per-day French plant on which design was based. If such a prediction comes true, Deere may also find itself in an excellent position to offer urea to plastics and adhesives manufacturers in the Western states.

New Competitor in Tall Oil Processing

Hercules Powder Co. of Wilmington, Del., is entering a new field—refining of tall oil for manufacture of resins, purified fatty acids and related products. A new plant, with an annual capacity of about 35,000 tons, will go into production early next year near Franklin, Va.

Dow to Lease, Not Buy U. S. Magnesium Plant

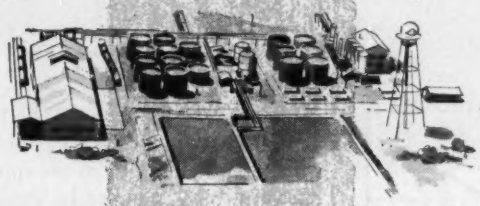
Though it tried hard to buy the government magnesium plant at Velasco, Tex. (*Chem. Eng.*, Dec. 1954, p. 110), Dow Chemical has given up the battle. Instead, the company will lease the facilities for three more years.

When Dow offered to buy the plant for about $13.5 million, both the General Services Administration and the Defense Dept. accepted. But the Justice Dept. stepped in, cited possible monopoly, and told GSA to find another buyer. It couldn't be done.

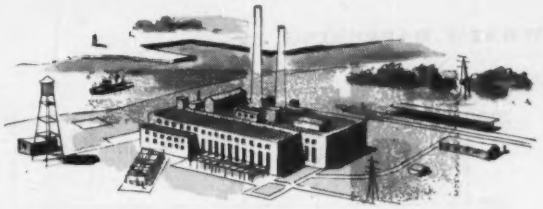
So Dow relinquished its hopes and will keep running the plant, though probably well below the rated capacity of 44,000 tons a year.

Courtaulds Plans Another Rayon Boost

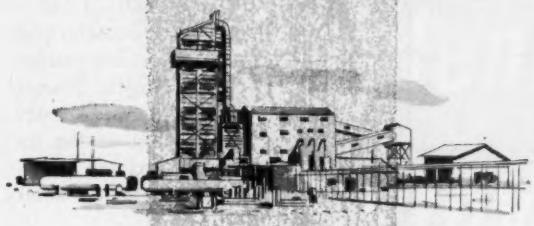
Present capacity of the Courtaulds (Alabama), Inc., rayon staple plant at LeMoyne, Ala., will be tripled by September. Originally designed for 50 million lb. of viscose staple annually, the company, in October of last year, announced plans to double this output by spring of 1955, now has upped the goal to 150 million lb. Initial operations began in 1953.



PETRO-CHEMICAL PLANT in Texas to produce ethylene from natural gas by the owner's process.



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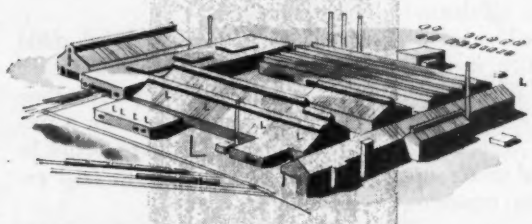
ORGANIC CHEMICAL PLANT to produce insecticides—DDT and BHC—located in the State of Alabama.

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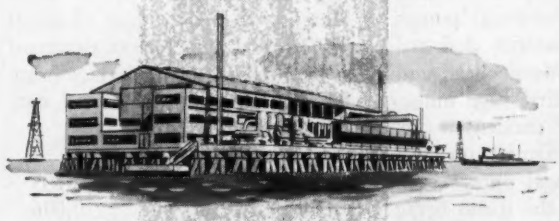


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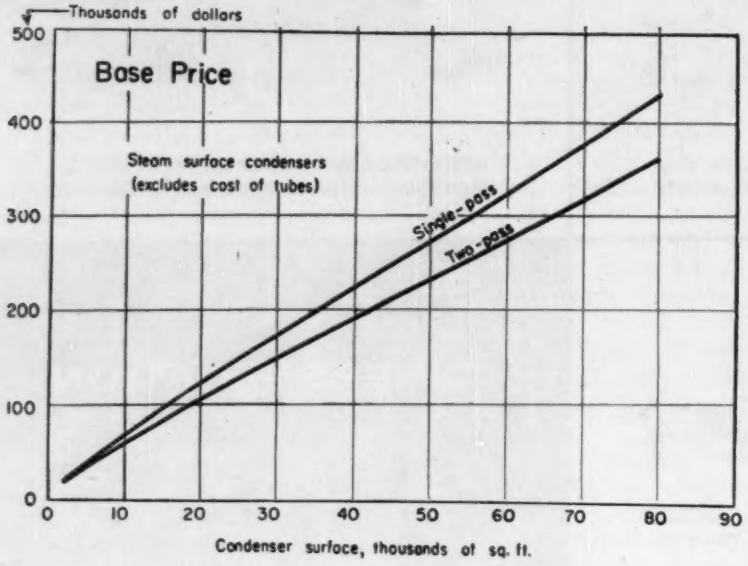
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To Figure Condenser Costs

- **Start with condenser base price.**
- **Add costs of tubes and auxiliaries.**
- **Correct for type and head of pumps.**

Although final selection and sizing of steam surface condensers is usually the job of the power-plant engineer, process engineers making preliminary cost estimates of new plants and expansions often need accurate cost data on this type of equipment.

Information given in the chart above (and those on the next page) was presented by W. E. Ellingen of Allis-Chalmers at a recent meeting of the American Society of Mechanical Engineers.* In the author's opinion the figures are sufficiently accurate for preliminary estimates.

▶ **Base Price of Unit**—Chart above shows base condenser price, excluding tubes. Ellingen treated tubes as a separate item, since it has now become common practice for the purchaser to furnish his own tubes. This practice is followed almost universally, he pointed out, with condensers larger than 14,000 sq. ft., whose tubes are installed in the field, and is becoming more common even with smaller condensers which are factory-tubed.

Included in base price, in addition to the condenser itself, is air-removal equipment, circulating pumps and motors, condensate pumps and motors, and spring supports with jacks or an expansion joint.

For the specific figures given, the air-removal equipment consists of one two-stage, twin-element steam-jet ejector. For water circulation, two horizontal centrifugal pumps divide the load; each is designed for 50 ft. total dynamic head and is driven by a squirrel-cage induction motor. For condensate removal, Ellingen figured on two horizontal centrifugal pumps each rated at 125% of the steam being condensed and delivering 225 ft. total dynamic head, again with squirrel-cage induction motors.

▶ **Add to Base Price**—Admiralty-metal tubes currently cost about $1.35 per sq. ft. of surface. For other commonly used tube materials, Ellingen suggested an appropriate correction factor be applied to the cost of admiralty, as follows:

Arsenical copper	1.093
Aluminum brass	1.139
Aluminum bronze	1.320
Copper nickel (90-10)	1.235

Differences in tube diameter and length are more or less compensating, according to Ellingen. Longer tube lengths will require less water but more surface; cost of the increased surface required will be offset by the lesser circulating water required.

Other auxiliaries, such as primers, air meters, piping and hotwells, add about 2% to the cost of the condenser.

▶ **Pump Corrections**—To correct base prices for different types of circulating pumps, Ellingen recommends use of the first graph on p. 118. This shows the cost of pairs of half-capacity, vertical pumps in comparison with that of horizontal pumps for any circulation load. Circulation load can be estimated from the two small charts at the right.

Type and head of the condensate pumps also affect total condenser cost. The final chart permits suitable corrections.

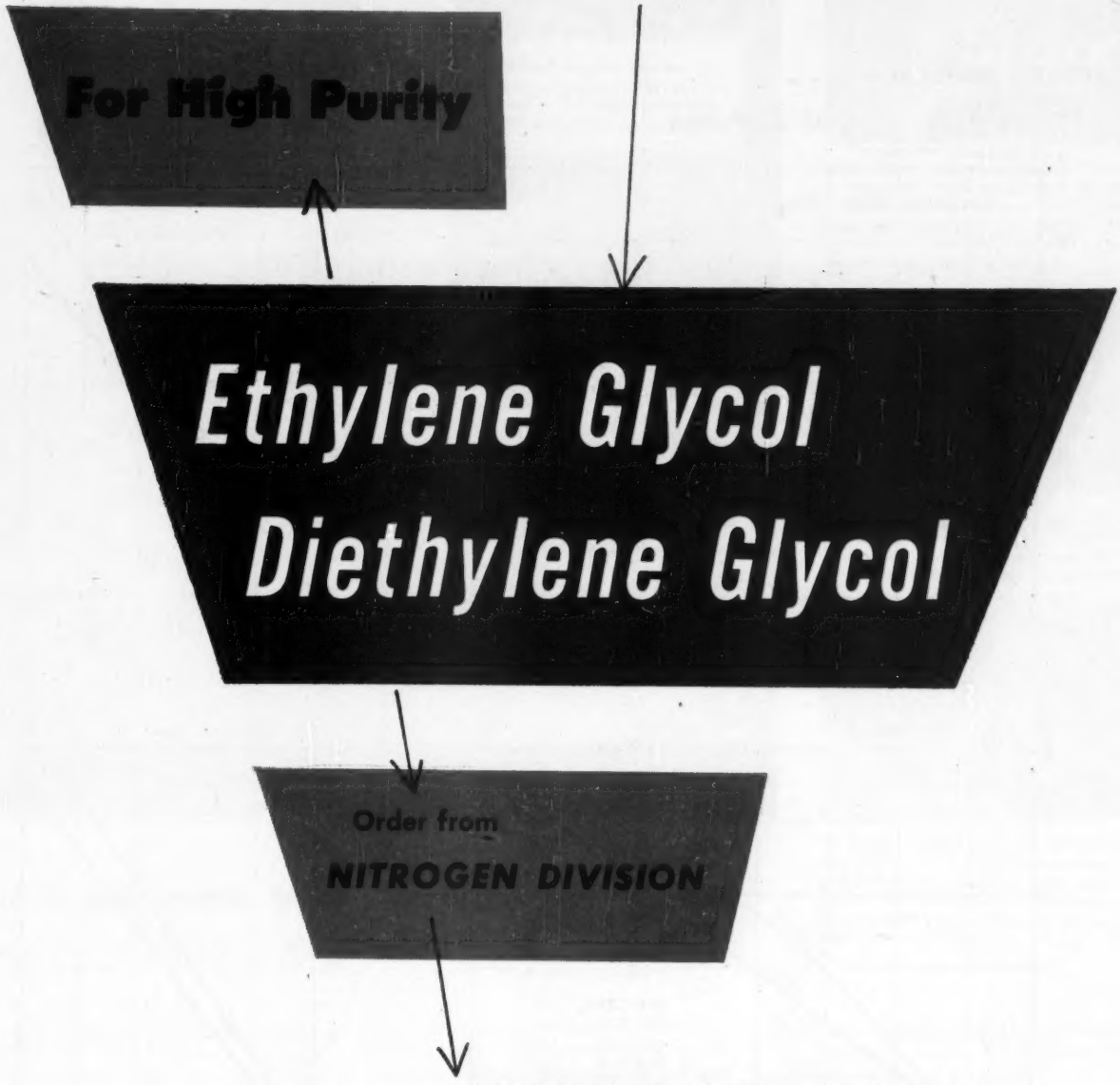
Ellingen's paper detailed other lesser corrections, but most of these were of minor significance in their effect on the total cost for a preliminary estimate. They would be important, of course, in final engineering estimates.

To facilitate working from initial specifications as to condenser load, Ellingen presented some curves relating steam condensed with surface required. His curves can be represented with a maximum of about 7% error by these factors, expressed as required condenser surface in sq. ft. per hourly lb. of steam condensed:

Single-pass	
¾-in. O.D. tubes	0.105
⅞-in. O.D. tubes	0.096
Two-pass	
⅞-in. O.D. tubes	0.135
1-in. O.D. tubes	0.120

▶ **For Example**—Here's an example

* Annual Meeting, New York, Nov. 28-Dec. 3, 1954. Paper No. 54-A-127, contributed by Heat Transfer Div.



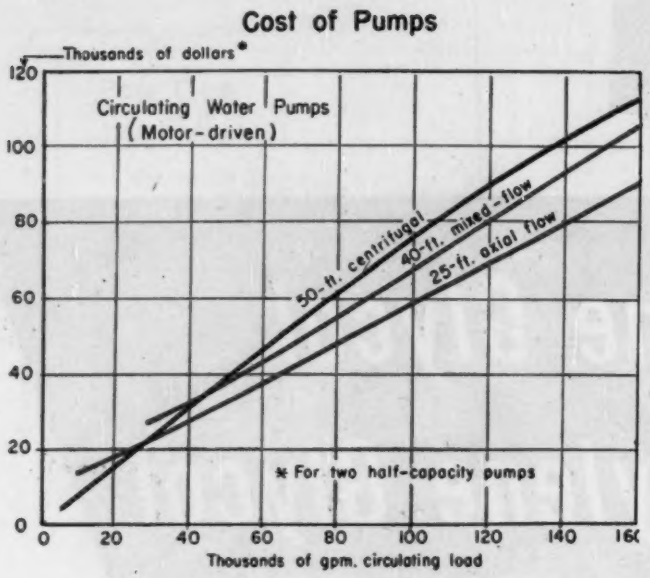
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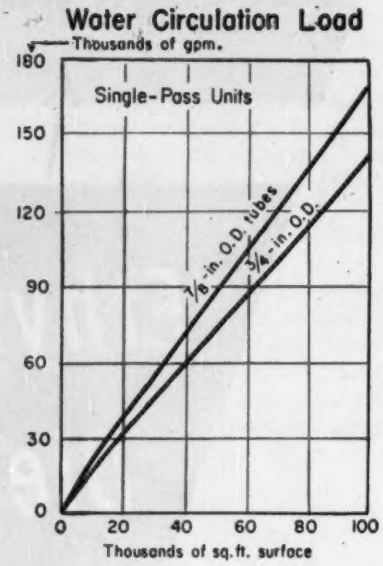
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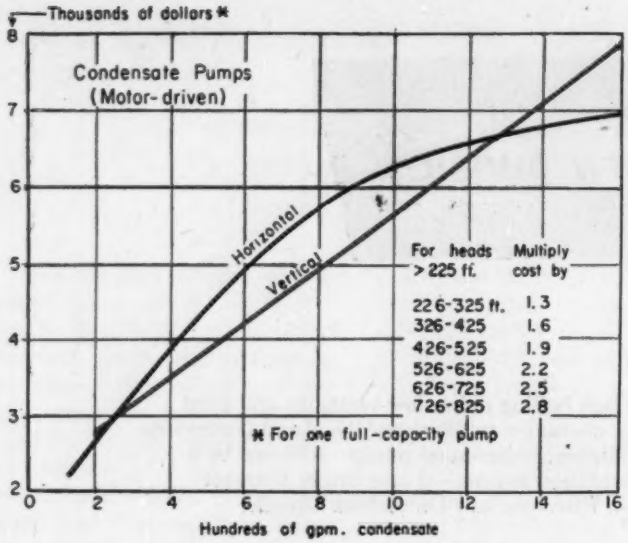
For help in adapting Glycols to your processes, call Nitrogen Division. An experienced technical service-representative will be pleased to work with you on your technical problems. For early production, act soon. Call or write today!

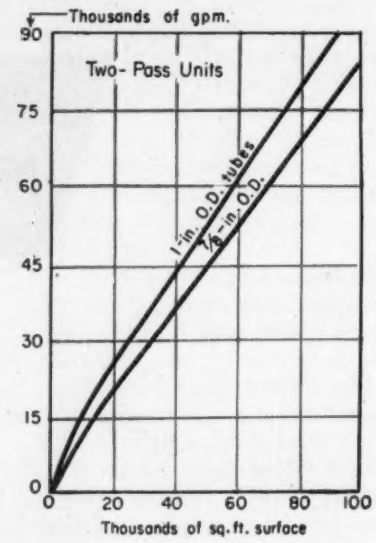
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showing use of the information presented in Ellingen's paper:

Assume a load of 600,000 lb. per hr. of steam to be condensed in a single-pass unit using ⅞-in. aluminum brass tubes. Circulation head will be less than 25 ft., so we can use axial-flow pumps. Instead of two full-capacity horizontal condensate pumps, we want to install three vertical half-capacity pumps, to deliver a head of 600 ft.

Surface required will be (600,000) (0.096) = 57,600 sq. ft.; base price for the condenser will be $320,000. Allowing for higher cost of aluminum brass, the tubes will cost (57,600) (1.35) (1.139) = $88,500.

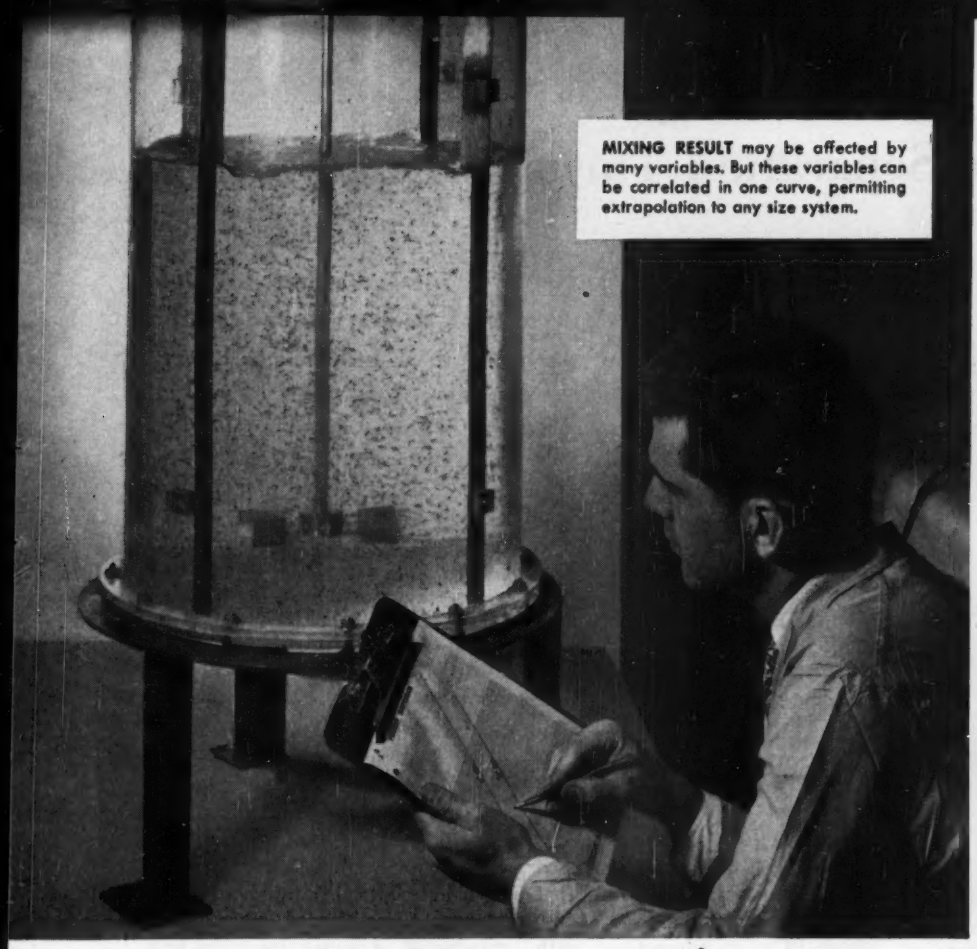
Our condenser will require about 98,000 gpm. of circulating water (from circulation vs. surface chart), for which the base price allows $75,000 worth of horizontal pumps (from pump cost chart). However, we can get by with $58,000 worth of axial-flow pumps, or a credit of $17,000.

At our steam load the two horizontal condensate pumps would be rated at 1,500 gpm. and be worth $6,850 each. Substituting three 750-gpm. vertical pumps and allowing for the higher head, we get (4,750) (3) (2.2) = $32,400, or an increase over base price of $17,700.

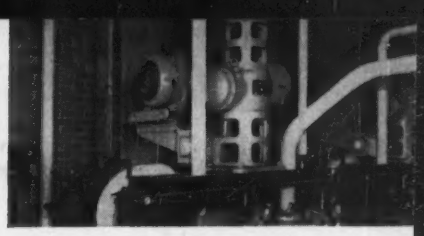
Other auxiliaries at 2% of base price will cost $6,400.

Final estimated cost is as follows:

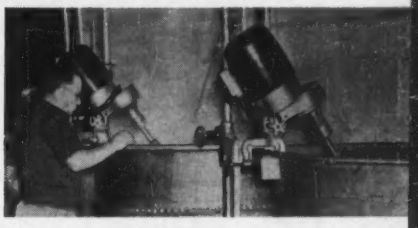
Base price	$320,000
Tubes	88,500
Circulating pumps	(17,000)
Condensate pumps	17,700
Auxiliaries	6,400
Total	$415,600



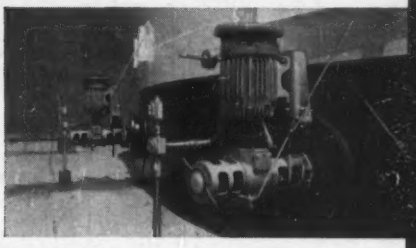
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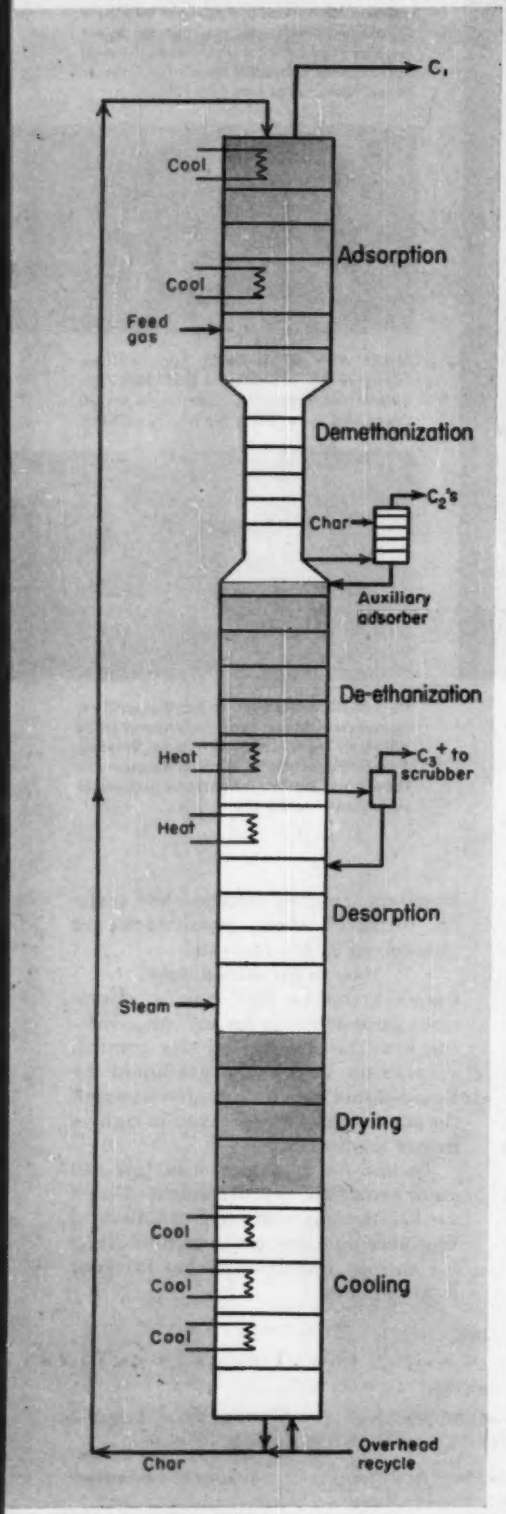
- ☐ DH-50 and DH-51 Laboratory Mixers
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Gas Separation Turns to Fluidization

Fresh from extensive pilot-planting, a new adsorption process is looking for takers. Main feature: Use of fluidized char particles in a bubble-cap tower.



POSSIBLE COMMERCIAL DESIGN has six major sections in one shell.

Newest look in gas separations is Standard Oil Development's use of the fluidized solids technique in its "Fluid Char Adsorption" process. Similar in concept to an oil absorber with a reboiler, FCA uses as the adsorbent finely divided, highly attrition-resistant activated charcoal moving down a multistage, bubble-plate tower.

True, nobody's rushed out to build a commercial plant yet. But interest is running high, particularly among oil refiners who want to separate C_2 and C_3+ fractions from fuel gas. Cost estimates, based on pilot-plant studies, indicate that for this application—and some others—FCA is competitive with the best existing processes, such as refrigerated oil absorption.

▶ **Nearing True Fluid**—More like an actual vapor-liquid operation than either fluidized catalytic cracking or reforming, which use a single large bed, FCA operates by stagewise contacting of char and gas in a number of beds—the bubble-cap trays. Char at about 120 F. enters the top of the adsorber section (see cut) and drops through the rising gases, which enter near the middle of the adsorber. Heavier gas components are preferentially adsorbed and lighter components go off overhead.

Inevitably, some lighter materials are also adsorbed, so a rectification section is provided to concentrate the heavier components. In some commercial designs additional rectification will be used to obtain sidestream products, such as C_2's. As shown at left, these streams can be further treated in small, separate char adsorbers for cleanup of small equilibrium amounts of heavy ends.

Char passes out of the adsorber into a desorber section, where it's heated to about 500 F. by Dowtherm vapors condensing in internal, vertical tubes. Contact with steam added at this point releases the adsorbed hydrocarbons. Part of these are sent back to the desorber, are dried and pass up to the rectification section of the adsorber as bottoms reflux. The rest are scrubbed with water and withdrawn as product.

Desorber char is stripped of steam by a small amount of recycled overhead product. It's then cooled to 120 F. for reintroduction to the top of the tower and picked up by lift gas (normally another stream of overhead recycle). Char flow is controlled by slide valves.

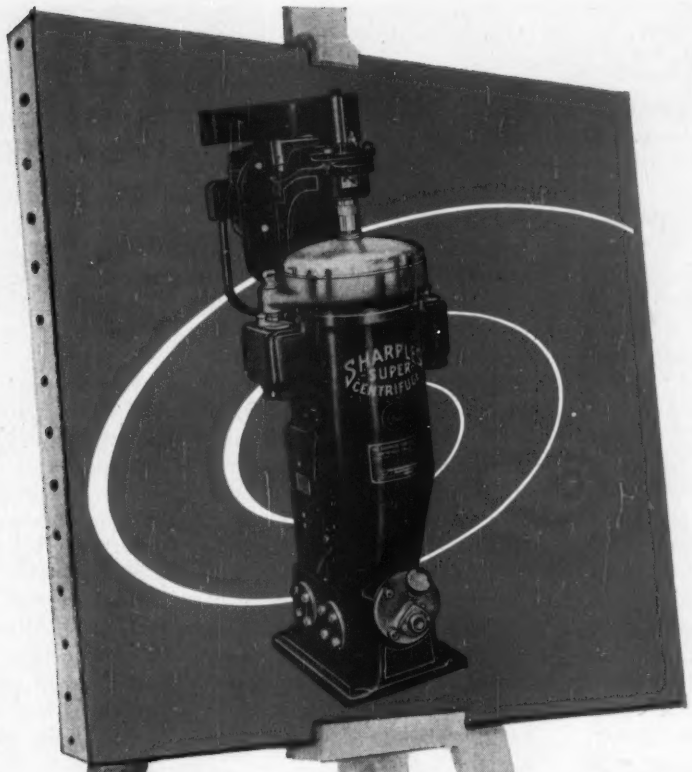
▶ **New Char Needed**—Char quality and cost, of course, are major keys to FCA's potential success. Both coconut shell char (at about 85¢ a lb.) and a petroleum-derived char were used in the pilot plant work and proved to be more attrition-resistant than cracking catalyst. According to SOD, less than 0.001% of the char circulated should be lost.

Though not now commercially available, the petroleum char used could be made on a small commercial scale at comparatively low cost. Therefore, says SOD, adsorbent make-up costs should not be significant. However, make-up with the better commercial chars now on the market, at current small-lot prices, would be an appreciable operating cost item.

▶ **Why Use It?**—Without citing actual figures in most cases, SOD claims these economic advantages for FCA:

- Small adsorbent inventory.
- High heat transfer coefficients for solids heating and cooling—an outstanding feature of fluidized solids processes in general.
- High allowable vapor and solid velocities, which minimize tower volumes.

(Continued)



Portrait of 13,200 x g

It is difficult to imagine the tremendous separating force of the Sharples Super Centrifuge—the highest commercially available, 13,200 times the force of gravity. Many conventional separating and clarifying problems are improved vastly, and many difficult problems are now being solved economically through the widespread use of Super Centrifuges.

The Sharples Super Centrifuge has raised the standards of reasonable expectation in centrifugal separation to effect one or more of the following operations: separate solids from liquids; separate immiscible liquids; remove liquids from solids.

Sharples Bulletin 1248 is the first step in putting over 13,000 times the force of gravity to work in your plant operations. A copy will be sent upon request.

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• Adsorber plate efficiencies in the 95-100% range, compared with oil absorber plate efficiencies of about 10%.

• High retention of light hydrocarbons (as much as 20 times more ethane than absorber oil—on a lb./lb. basis—at substantial pressures).

• Adaptability to stage-wise cooling in the adsorption section and heating in the rectification section. This minimizes char circulation rates, exchanger surface area and utilities consumption.

▶ **Who Can Use It**—In addition to C_2 and C_3+ separation from fuel gas, SOD thinks its new technique shows considerable promise in such applications as hydroformer hydrogen purification, concentration of acetylene made by partial combustion or severe cracking of light hydrocarbons, recovery of solvent vapors from air, gas drying and recovery of light ends from hydrocarbon synthesis reactions.

Note that all of these are light hydrocarbon separations. One reason for this is that absorber oil capacities for high-boiling materials approach those of activated carbon even at moderate pressures. Also higher boiling mixtures are usually separated easily by distillation. So in general, unless the high-boilers are in low concentration, gas adsorption can't compete with conventional techniques in separating such mixtures.

▶ **Char Activity a Problem**—Another reason why SOD is sticking to light hydrocarbons is that even small amounts of polymerizable materials boiling above pentanes quickly cause char deactivation. A small amount of polymerization of olefins or diolefins on the char has the same effect.

Deactivants normally present in refinery fuel gases are comparatively mild, however, and during long pilot plant runs with no reactivation char activity reached an equilibrium value of 75-80% of original—a satisfactory level. Using high temperature reactivation with steam, char activity was kept above 90% for a three-month run.

Some laboratory work has been done on reactivation schemes and the results are promising. For instance, activity of chars subjected to severe deactivants was restored to 90% or better by steam-treating at 1,200-1,400 F.

But SOD warns that a lot of development work is still needed on reactivation and feels that its process is commercially ready only for separation of feeds containing mild deactivants. No reactivation should be required at all, says SOD, if feeds contain no materials boiling higher than pentane (unless not subject to polymerization) and no unsaturates other than ethylene, propylene and acetylene.

With these limitations, though, FCA appears ready to go. And Stone and Webster Engineering Corp. (New York) has been authorized to negotiate nonexclusive licenses.

Mexican Coking Plant Helps Chemical Supply

More important even than the nominal product—coke—are the chemical derivatives that will be made in a new $7.2 million coking plant in Mexico. Located at Monclova in the northern state of Coahuilla, this installation is now running at capacity output of 57,000 tons of coke a month. But in addition the plant will supply ammonium sulfate, benzene, toluene, xylene, naphtha solvents, tars, anthracene and naphthalene.

There has been considerable speculation that coke production in Mexico is already sufficient. However, all three Mexican steel mills are expanding by 50% each, so there shouldn't be any excess coke for long.

Nobody questions, however, that Mexico badly needs increased chemical production. And with huge supplies of sulfur set to come into production in the Isthmus of Tehuantepec (estimates run from 200,000 to a million tons a year of pure Frasch sulfur), the demand for processing chemicals is certainly going to grow rapidly. For instance, there are three new fertilizer plants now planned in Mexico at a cost of $50 million.

Hydrogen and Olefin Processes Offered

Two reforming processes developed by Hercules Powder Co., Wilmington, are now available to industry through the Chemical Plants Div. of Blaw-Knox Co. of Pittsburgh. One produces hydrogen, the other, a mixture of ethylene, propylene and other olefins. Both use alloy tubes set vertically in furnaces operating at high temperature.

For hydrogen, natural gas or propane is mixed with steam and catalytically reformed to a CO-H_2 mixture. This mixture passes through a shift converter, giving CO_2 and H_2. Recent improvements in this method, says Blaw-Knox, make liquid petroleum fractions feasible as raw materials.

The olefin process uses similar apparatus in a thermal reaction. Separation of products can be achieved through cryogenic or absorption processes also available from Blaw-Knox.

Links Research With Commercial Production

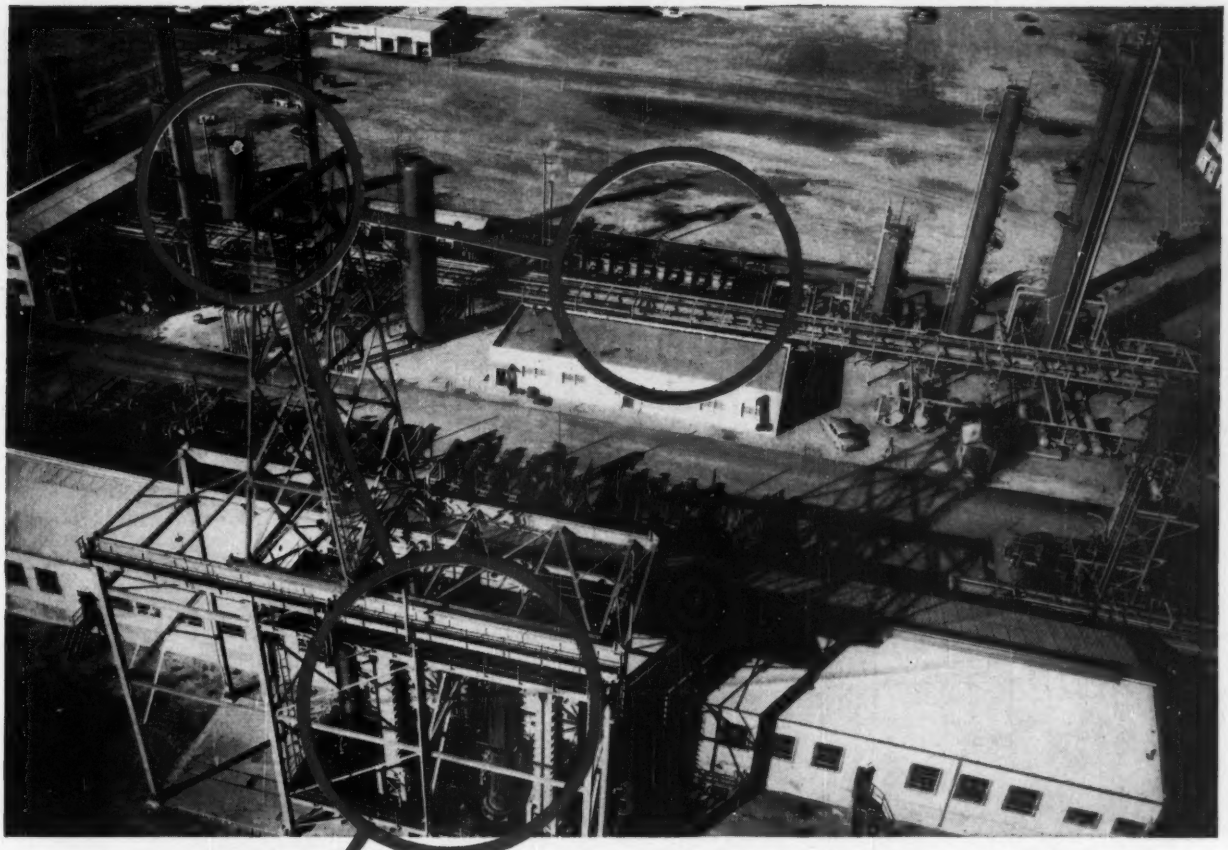
A new development plant just completed by the Chemical Div. of Koppers Co. at Kobuta, Pa., is designed to accomplish the two main phases of product commercialization. It will be used to:

• Adapt Koppers' research-developed material to commercial use;

• Produce semi-commercial quantities for sampling by customers during the period of market development.

Actually, the new installation is a combination laboratory and overgrown pilot plant. Sizable quantities of materials can be made and simultaneously tailored to customer specifications.

Included in the facilities are large and small reactors, centrifugals, dryers, extruding equipment and, of course, a large modern control laboratory. Emphasis will be on polymer and copolymer plastics that can be injection molded, extruded or expanded into shape.



NH_3

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FW SEQUENCE

1 TEXACO PARTIAL OXIDATION

Reforms natural gas to produce mixture of H_2 and CO. No catalyst required. Uses simple, refractory-lined vessel—no complex furnace with expensive alloy tubes. Not affected by sulphur content in feed stream. Easily convertible to fuel oil instead of gas.

2 FW LIQUID NITROGEN WASH

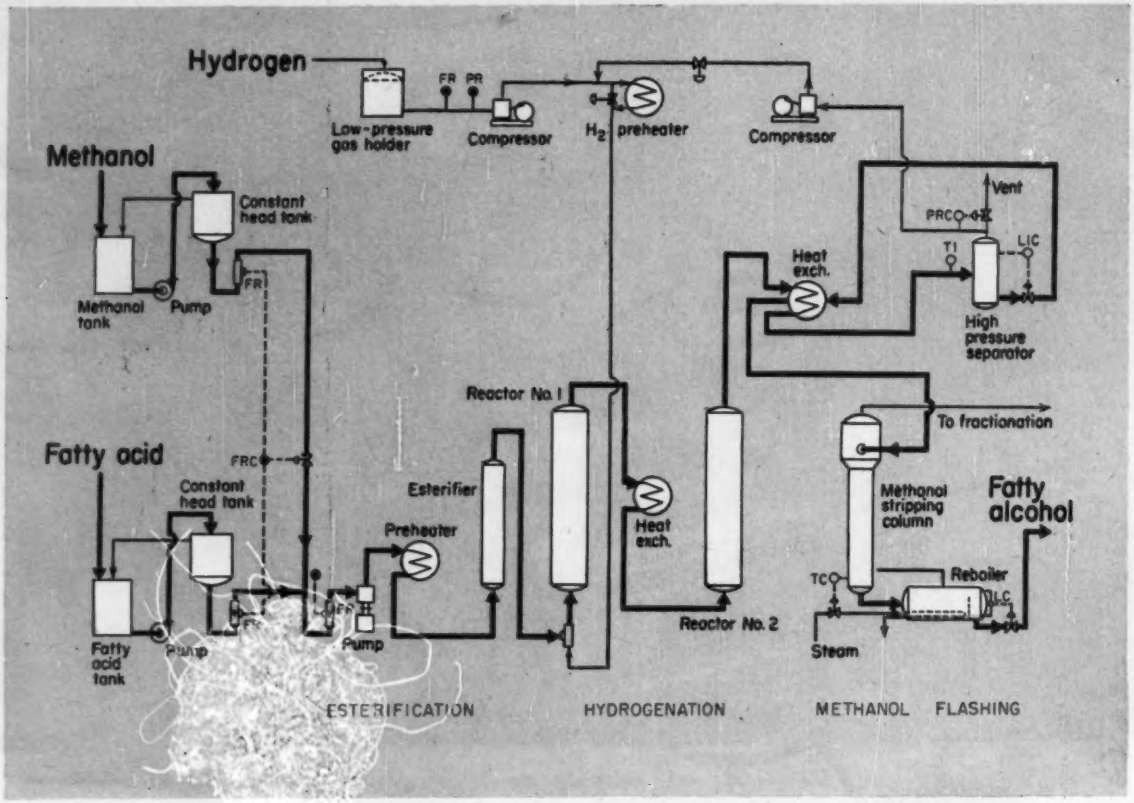
Removes final traces of CO, methane and argon from feed stream. Assures high-purity H_2 for ammonia synthesis. Introduces no inert material or water vapor and keeps purge gases from synthesis train to the minimum. Reduces laboratory control and operating manpower.

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The simplest, most dependable synthesis method for producing liquid anhydrous ammonia. Proved in service the world over. Operation at 9,000 to 12,000 psi assures high conversion per pass, results in small equipment and permits condensation to liquid ammonia with cooling water only. No refrigeration required. Uses simple ejector for recycling—no recirculating compressor, no danger of oil contamination. Extreme simplicity of process flow reduces the cost of equipment, installation, operation and maintenance.

For the complete cost-saving story of the FW sequence, send for Bulletin No. 0-54-1. Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.

FOSTER WHEELER



SBA FATTY ALCOHOL PROCESS now offered in U. S. by the Blaw-Knox Co. is one promising method . . .

Score Two More for Catalytic Hydrogenation

Two processes used in Europe to make fatty alcohols now flirt for American attention, hope to supplant the De Nora process and sodium reduction.

To a manufacturer of detergents there really isn't much difference between a product based on dodecyl benzene sulfonate or a fatty alcohol sulfate. As long as the price of one is in the same ballpark as the other he'll be interested in both as materials for formulation.

What's the cheapest way to make a fatty alcohol then? Well, there are two new candidates on the American scene. The Blaw-Knox Co., Pittsburgh, Pa., after studying many processes has decided to offer the one developed by SBA*. SBA is a Belgian chemical company experienced in the manufacture of ammonia, methanol, synthetic gasoline and detergents.

Rust Engineering Co., also of Pittsburgh, is trying to sell the Sinnova process. Sinnova is a leading detergent manufacturer in France and an affiliate of the American Alcolac Corp., Baltimore, Md. Both processes involve catalytic hydrogenation. That makes three.

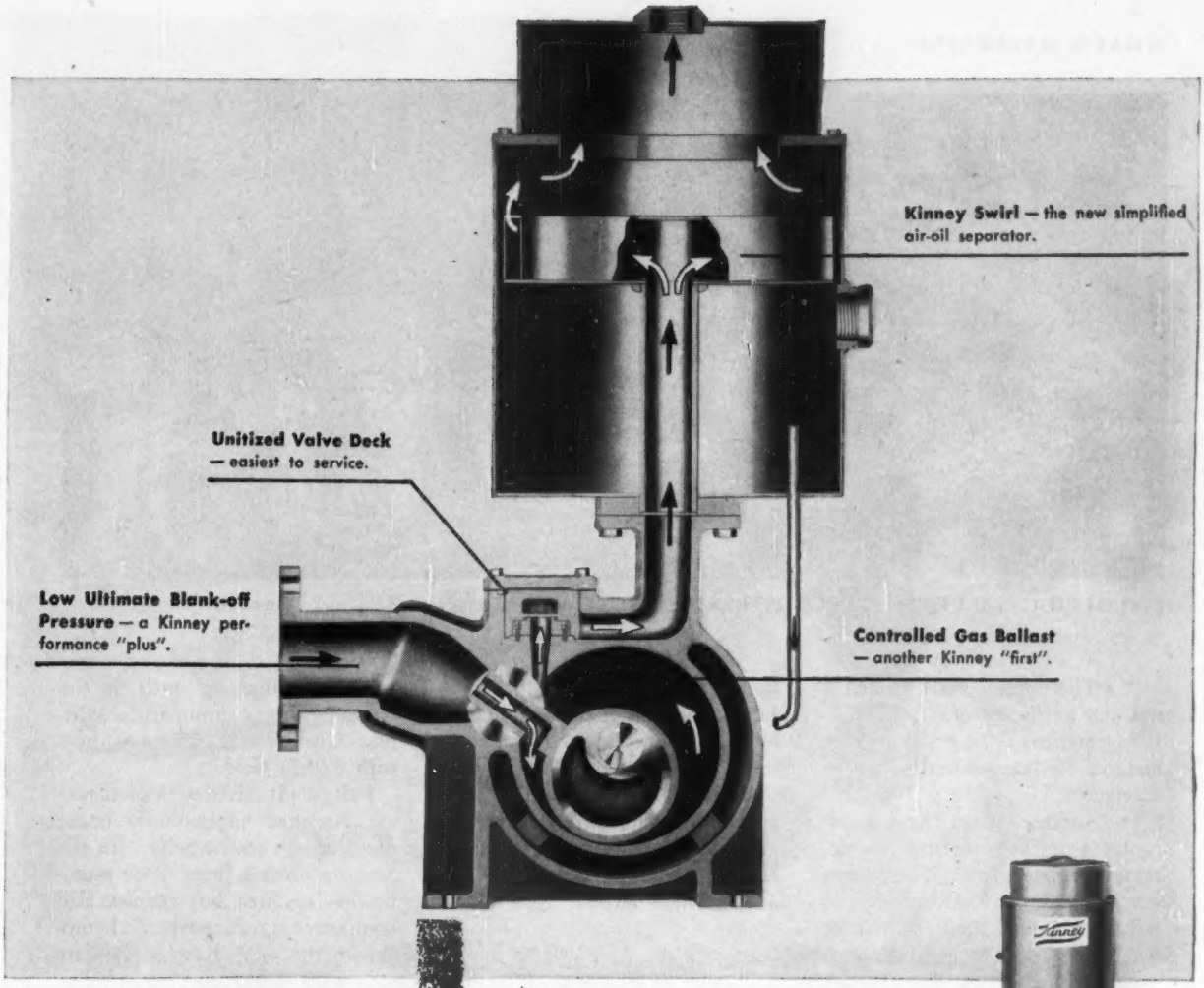
The De Nora high-pressure process for hydrogenating fats and fatty acids to fatty alcohols made its American debut in 1950 at the Long Beach, Calif., plant of Procter & Gamble. Essentially, the De Nora process is a semi-continuous autoclave operation. Procter & Gamble has since converted it to continuous operation.

► **Sodium Challenged**—All of these catalytic hydrogenation processes hope to take on some of the work now done by sodium. Most production of fatty alcohols in this country is based on the traditional reduction of fatty acids by sodium metal (the Bouvealt-Blanc method first accomplished in France in 1903).

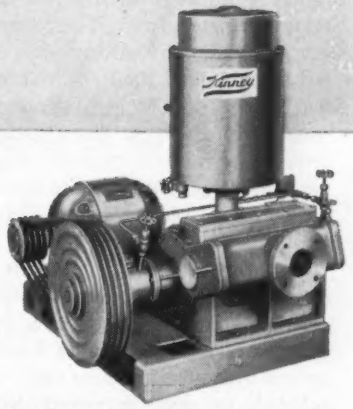
In spite of definite improvements in the sodium reduction process over the past 50 years there are still some disadvantages:

- Raw materials must be rigorously dehydrated before reaction.
- Reaction products always contain some soaps that make the separation of pure product difficult and involve a loss of some heavy alcohol.

* Societe Belge de L'Azote et des Produits Chimiques du Marly.



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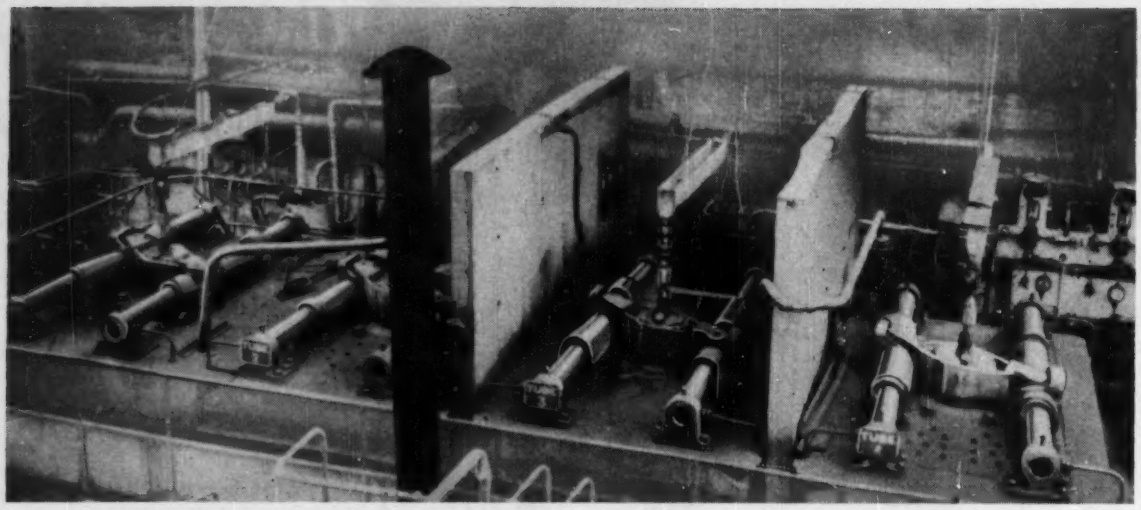
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FIXED-BED CATALYTIC HYDROGENATION REACTORS were originally used to make ammonia.

• The dilute NaOH formed is not easy to dispose of.

• Sodium is an expensive raw material for large-volume low-price detergents.

▶ **Try Another Way**—These disadvantages spurred research to develop alternate routes. Thus, these new processes for hydrogenation of fatty acids and their natural or synthetic esters. At high temperatures and pressures, and in the presence of metallic catalysts (copper, chromium, nickel), the esters yield their corresponding fatty alcohols.

However, all hydrogenation processes have one major disadvantage. Any high-pressure process over hydrogenates and gives some hydrocarbon byproducts. These can't be sulfated to give detergent base materials and must necessarily be charged off to loss. Also, there's some question about controlling the degree of hydrogenation so that unsaturated fatty acids give unsaturated fatty alcohols. This is tied in with the question of relative markets for saturated, unsaturated and mixed alcohols for detergent bases.

At least one producer, the Du Pont Co., finds it advisable to use both the sodium reduction and catalytic hydrogenation processes in its fatty alcohol plants.

▶ **Cost in Range**—What does catalytic hydrogenation cost? Let's take the Blaw-Knox SBA process as an example. After pilot-plant tests in Belgium on any potential feedstock, Blaw-Knox offers to erect a complete fatty alcohol plant and guarantee yield, product quality, operating costs and catalyst life. Here are some estimates for producing tallow alcohol from tallow:

Capacity	17,000,000 lb./yr.
Investment	$1,850,000
Tallow cost	7¢/lb.
Methanol cost	5¢/lb.
Hydrogen cost	$2.71/M.cu.-ft
Glycerine credit	20¢/lb.
Catalyst	10¢/100 lb. of product
Operating cost	$1.68/100 lb.
Fixed charges	$1.50/100 lb.
Total production cost	$10.68/100 lb.

Investment and operating costs include equipment for fat splitting and fatty-acid distillation.

Latest quotes on refined tallow are now about 8¢/lb. rather than the 7¢ figure used in this estimate. But in any event 11 or 12¢ tallow alcohol puts it in the race with petroleum bases for detergent manufacture.

▶ **Process Details**—There are three major steps in the SBA process (see flowsheet):

• Conversion to fatty acid methyl ester.

• Hydrogenation of the methyl ester to the alcohol.

• Methanol stripping.

The selected fat can be hydrolyzed in equipment such as the Colgate-Emery continuous fat splitter. Glycerine is recovered here with a 98% yield.

Fatty acids mixed with methanol are esterified continuously under pressure in a steel reactor. (In the Sinnova process there is no esterification required but stainless-clad equipment is necessary). To hydrogenate the methyl esters they are pumped into two reactors in series. In the first the carboxyl group is reduced to hydroxyl. And in the second, the unsaturated bonds are saturated by hydrogen.

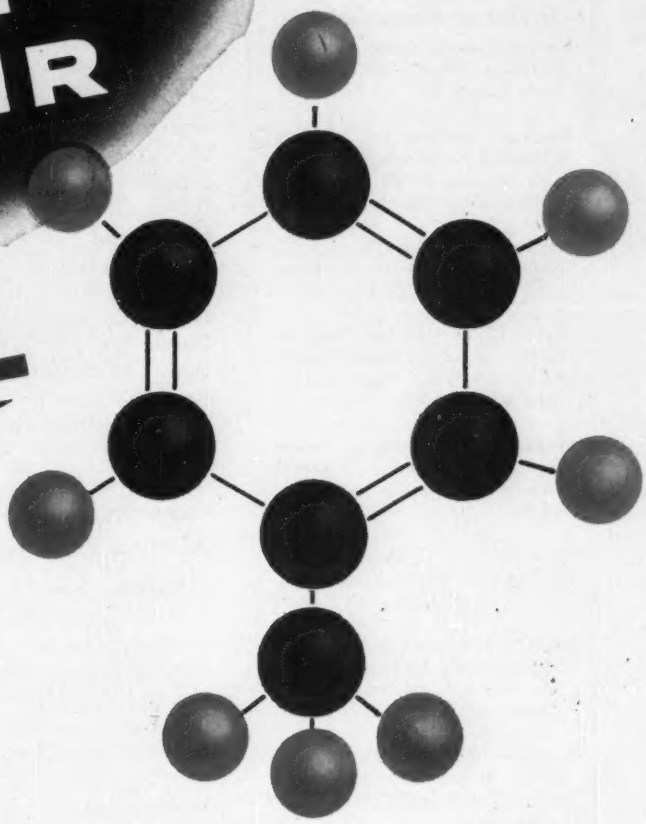
Both reactions take place in fixed-bed catalytic reactors. (Sinnova's modification involves some recirculation of catalyst through the reactor.) SBA catalysts are specific for each duty and need to be changed about two to three times per year.

According to Blaw-Knox, the SBA catalyst should last much longer than Sinnova's since no free fatty acids are present.

Operating pressure is between 4,500-7,500 psi. Increasing pressure reduces the reaction temperature required which then in turn holds down the formation of hydrocarbons and ether oxides.

Excess hydrogen recirculates and methanol flashes off in a stripping tower, is also recovered for re-use. Yield of undistilled tallow alcohol is about 96% of theory.

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Designed especially for quantity production of high purity aromatic hydrocarbons, including toluol, xylol and heavy aromatic solvents, the newest of Sinclair's chemical units is now being completed at Marcus Hook, Pa.

This new unit, which will provide a dependable supply of petro-chemicals for industry, will be in full production in March, 1955. Its operation marks another step forward in Sinclair's progress in the petro-chemical field.

If your manufacturing processes call for toluol, xylol or other aromatic hydrocarbons and solvents, be sure to investigate this new source of supply. Write or call—

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Convention Calendar

First International Congress on Air Pollution, Hotel Statler, New York, March 1-2.

Chemical Institute of Canada, Chemical Engineering Division's fifth conference, 18 Rideau St., Ottawa, Ont., March 7-9.

American Institute of Chemical Engineers, Kentucky Hotel, Louisville, Ky., March 20-23.

World's Plastic Fair and Trade Exposition, National Guard Armory, Exposition Park, Los Angeles, April 6-10.

American Oil Chemists' Society, 46th annual meeting, Roosevelt Hotel, New Orleans, La., April 17-20.

Third National Air Pollution Symposium, Huntington-Sheraton Hotel, Pasadena, Calif., April 18-20.

American Management Association, 24th National Packaging Exposition, International Amphitheatre, Chicago, April 18-21.

Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Los Angeles, April 27-28.

More High-Impact Polystyrene Planned

Union Carbide's Bakelite Co. will build new facilities at Bound Brook, N. J., to produce high-impact polystyrene and new molding materials made from polystyrene. Other units are now going up at Marietta, Ohio, which will "again double the firm's output" by the end of 1955.

Major Carbon Black Plant Running Now

The first third of a plant that will be making 60 million lb. of carbon black annually by the end of this year has been put in operation near Franklin, La., by Columbian Carbon Co.

It's a refreshing sight, too. For instead of the trail of smoke that characterizes so many carbon black plants, only a white plume of condensed steam issues from this one. The reason: essentially 100% overall collection efficiency.

The collection system includes an electrical precipitator, three-stage cyclone collection and a special bag filter. Silicone-treated glass is used for the filter bags, rather than synthetic fibers. This allows filters to run at higher temperatures and minimizes corrosion problems.

Ninety percent of the raw materials for the unit are waste products barged in from Gulf Coast refineries. The rest is natural gas. When the whole plant is finished it will have cost $3 million.

Capacity Boost for Allotropic Sulfur

Stauffer Chemical Co. is now in a position to supply increased demand for Crystex, a special allotropic form of sulfur. Reason is a new $800,000 plant (the company's third) at Monongahela, Pa., that converts ordinary rhombic sulfur to allotropic continuously. Nearness to rubber plants, a major consumer of the product, dictated the plant location.

The Stauffer process involves quick chilling of molten sulfur in carbon disulfide with the separation of insoluble, polymerized allotropic sulfur (estimated to have a molecular weight of several hundred thousand).

Insoluble in all known solvents, Crystex can easily be reconverted to rhombic by heating, permitting normal sulfur activity. This property is what attracts the rubber industry, where normal sulfur activity prior to curing causes undesirable "blooming." Insoluble sulfur, on the other hand, stays inactive until the curing temperature causes normal vulcanization.

Less Stream Pollution By Sulfite Liquor

Important reductions in the volume of sulfite liquor released into Wisconsin streams were achieved last year by soil filtration, according to Wisconsin Pulp and Paper Information Service. More than 295 million gal. were disposed of in this way.

Eight Wisconsin sulfite mills used the technique in 1954. It consists of flowing or spraying spent liquor on ground surface areas or in ponds. As liquor filters through the soil, bacteria eat up much of the sugar and other organic matter, decreasing its oxygen-consuming character before it ever reaches watercourses.

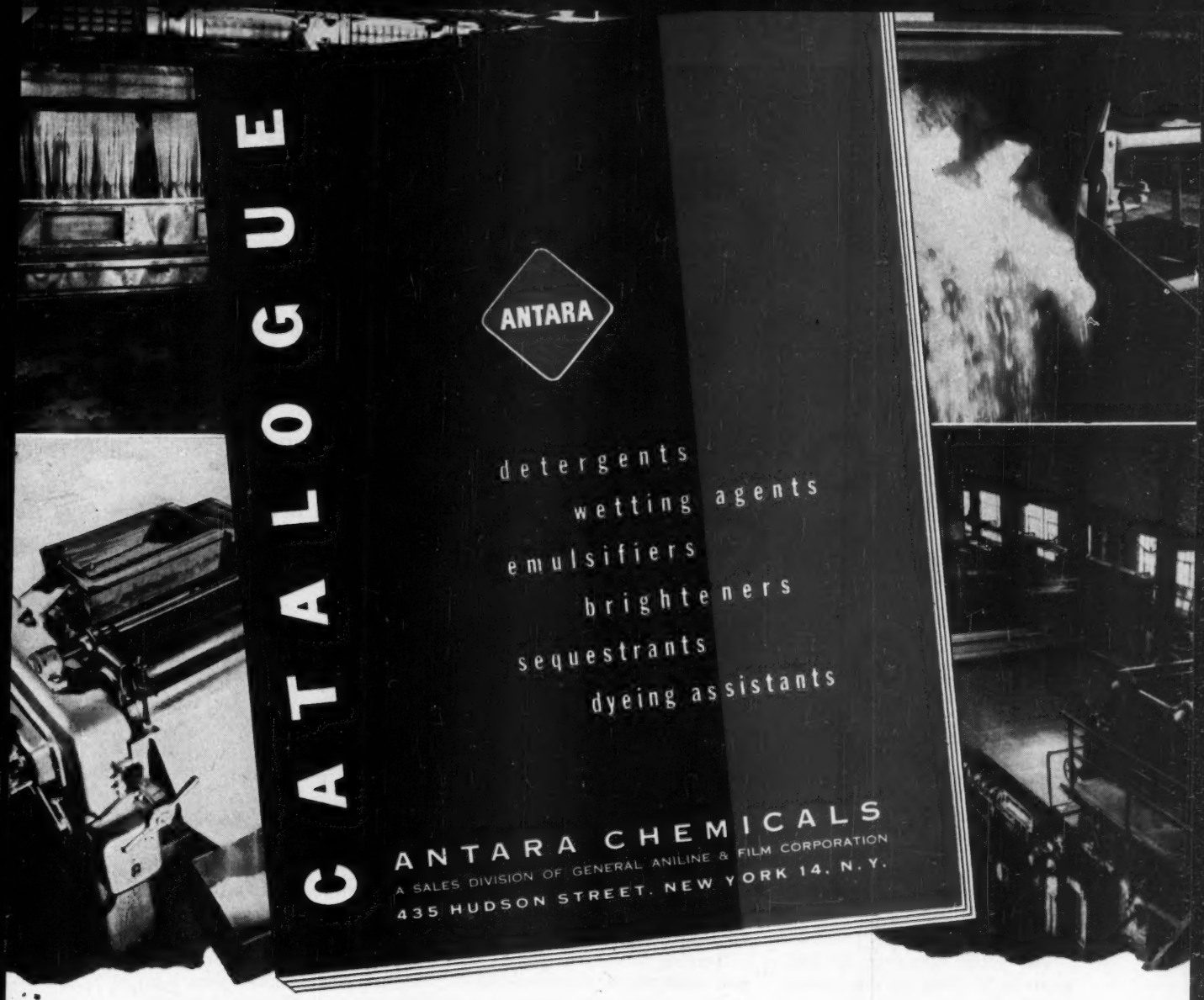
Compromise on Canadian Gas for the Northwest

Though turned down recently by the Federal Power Commission on a proposal to bring natural gas to the Pacific Northwest area from northern British Columbia, Westcoast Transmission Co. of Calgary, Alta., looks like it will get into the act anyway. The reason is a newly made agreement between Westcoast, El Paso Natural Gas Co. and Pacific Northwest Pipeline Co. of Houston, Tex.

Last year (*Chem. Eng.*, Sept. 1954, p. 134), the FPC approved Pacific Northwest Pipeline's plan to build a pipeline from Colorado to Washington for transmission to the Northwest area of up to 365 million cu. ft. a day of natural gas. Westcoast's plan to bring this gas in from Canada was rejected at the same time because of lack of an inter-governmental agreement assuring continued adequate supply from Canada.

The new compromise, which has yet to be approved by the FPC, calls for Westcoast to deliver 300 million cu. ft. of gas daily to Pacific Northwest Pipeline at a point on the U. S.-Canadian border near Vancouver, B. C. Pacific Northwest Pipeline will build a line to that point to receive the gas.

Also, Pacific has agreed to sell 250 million cu. ft. of gas a day to El Paso Natural Gas. El Paso expects to build a pipeline from Mountain Home, Idaho, to Reno, Nev., to distribute the gas. This will connect with the two Pacific Northwest Pipeline lines—one from Canada, one from Colorado.



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Centrifugation

Gravity Separation

Bio-Oxidation

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Get the Most Out of Waste Disposal

Few waste disposal operations boast more well knit, dollar-saving engineering than does the one serving Imperial Oil's refinery at Sarnia, Ont. Centrifugation, biological oxidation, gas neutralization-stripping, and gravity separation all join to squeeze liquid wastes dry of byproducts, Btu. and pollution potential.

The entire operation, in fact, seems to be based on this healthy premise: If you've got to dispose of waste then do a good, complete job of it—but first make sure you get back everything that's worth more than it will cost you to recover it.

But the dollar-saving doesn't start with the recovery process. It's pointed up, first in the materials and equipment selected to do the job:

• Imperial uses catalytic cracking flue gas from its nearby refinery to neutralize alkaline streams. Supplied under 6 psi. pressure, this gas needs no blower to move it through the tower.

• Removal of most of the oil and water from waste sludge permits a smaller incinerator—and lower capital investment—to handle disposable solids. And use of centrifugation to separate before incineration, instead of a more conventional precoat filtration on rotary filters, reduces capital investment, operating and maintenance costs.

• The activated sludge tank in the bio-oxidation unit serves as a combined aeration and sludge-settling basin, with the economies that go with equipment consolidation.

Turning, now, to the process, we find most recovery of byproducts and energy occurring in two steps: neutralization and solids separation.

Neutralization of spent caustic soda with flue gas and sour water condensates yields petroleum acids (including phenols) which either are burned or sold as raw materials for manufacture of organic chemicals and plastics. Overhead material—H_2S, ammonia and phenols—from the neutralization tower is burned as fuel in a process furnace.

Two-stage centrifugation of waste sludge recovers oil suitable (less than 0.05% water) for reprocessing—enough, in a year's time, to more than pay for the installation of the centrifugals. The first stage dewaters and deoils the solids before incineration. The second stage, by removing any finely divided solids remaining in the effluent from the first centrifugal, breaks any oil emulsions and increase yield.

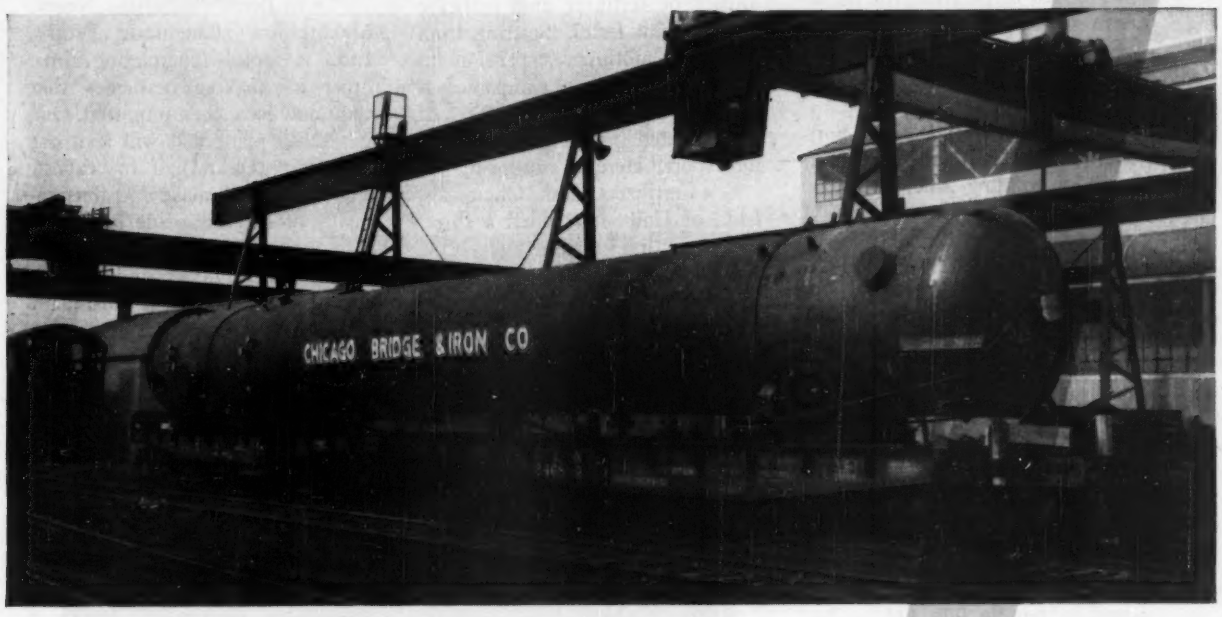
▶ **Finishing Touch** – Any liquid wastes after byproduct recovery, plus some which come directly from the refinery, go through the bio-oxidation plant for final polishing—removal of phenols and other reducing compounds—before release to the St. Clair River. This unit, consisting of a trickling filter as well as an activated sludge tank, handles half a million gal. of wastes a day, discharges an effluent with less than 20 parts per billion of phenol equivalents, costs about 6¢ a lb. of phenol destroyed.*

Some of Imperial's equipment—the circulator separators used to recover clean cooling water from oil-contaminated water—at the Sarnia waste processing plant, although familiar to the chemical processor, is fairly new to the petroleum industry. In Canada, the first circular unit was installed in 1952, the next two being the clean- and oily-water pair at Sarnia.

Oil people are finding the circular variety has, in the main, two advantages over the older, rectangular type: There are no multiple chambers; only one mechanism is needed for skimming sludge and

*Costs of other methods for oxidation of one pound of phenol: 40¢ for ozone, 70¢ for chlorine, about $2 for chlorine dioxide.

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. . . the more exacting workmanship and knowledge required to build complicated welded steel plate structures. The 8-ft. diam. by 80-ft. CO_2 absorber tower shown above is an example. This structure was built by CB&I to exacting specifications under contract from Foster Wheeler Corporation for the Grace Chemical Company at Woodstock, Tennessee.

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recoverable oil from the bottom (rectangular separators employ multiple flight scrapers).

Like any forward-looking project serving as a proving ground for future units, Imperial's waste disposal setup at Sarnia needs, and is getting, improvements. In the biological oxidation step, for instance, some change is in order in the form of feed preparation, the preparation which involves removal of sulfides and oil followed by reduction in alkalinity. (Flue gas lowers pH to about 9.) The incinerator, a multiple-hearth type with horizontal rams rather than the rotating hearth or rotating arm system, is undergoing minor changes.

▶ **Process Bits**—Cat cracker flue gas flows to the neutralization-stripping tower at 560-1,000 cfm. at 400-500 F. and 6 psi. The gas consists of 11% CO_2 with lesser quantities of CO, O_2 and SO_2. Sour water feed is about 60 gpm., has an H_2S content of 0.25-0.35%; ammonia, 0.30-0.35%; phenolic material, 500-700 ppm. Spent caustic is charged at 1.5-3 gpm. Steam required: 2,000-5,000 lb. per hr. at 120 psi.

The centrifugation unit is designed to handle 900 bbl. a day of tank bottoms, oil separator bottoms and emulsions from separators and slop tanks. The first centrifugal removes 95% of the solids containing 19% oil and 15-40% water. The incinerator consumes 25 tons a day of separated solids.

Italy Will Make Rubber and Fertilizers

ANIC, which belongs to a group of Italian-government-controlled oil companies, is building a $75 million plant at Ravenna, Italy, to produce 30,000 tons a year of synthetic rubber and 350,000 tons of nitrogenous fertilizers. Principal raw material will be 14 million cu. ft. of methane daily. Union Carbide will help design and build it.

Italy now imports about 57,000 tons of natural rubber and 10,000 tons of synthetic annually. It's believed that synthetic consumption will rise greatly as soon as the new plant starts producing. For a while, though, exportable surplus will be 15,000 to 20,000 tons.

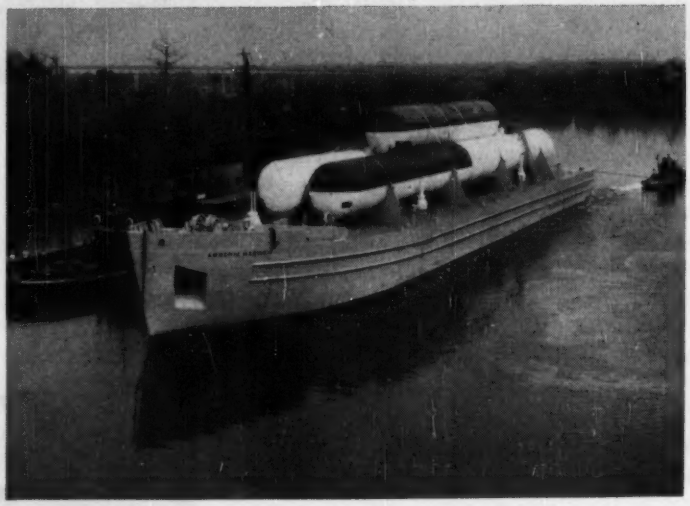
Israel Expanding Ag Chemical Output

World markets may soon feel the impact of fertilizer and pesticide exports from Israel. Starting from practically nothing, expansion in those lines—by two companies—is in full swing. Large percentages of the expected production are slated for export. Here's a rundown:

• Fertilizers and Chemicals, Ltd., of Haifa has added a three-unit plant that's making phosphoric acid, dicalcium phosphate and potassium sulfate. The same firm is building a $3.5 million ammonia plant (14,000 tons a year) and a 40,000-ton-per-year ammonium sulfate plant, both scheduled to start up in May.

Annual production capacity for dicalcium phosphate and potassium sulfate, both of which will be exported, is 10,000 and 12,000 tons, respectively. Total chemical output of F. & C. plants this year is expected to reach $10 million, 30% earmarked for export.

• In Beersheba, in the Negev, Makhteshim Chemical Works, Ltd., is rapidly completing three units for making pesticides that until now have been imported. One is a DDT plant that will turn out 350 tons a year, half for export. The second will make 750 tons annually of cuprous oxide for fungicide uses. This is about triple Israel's current needs, and the balance will be exported. A third plant will make 240 tons of 2,4-D, about 83% of which will be available for export.



World's Largest Ammonia Barge

The Ammonia Mariner, biggest seagoing barge ever built for bulk shipment of liquid anhydrous ammonia under pressure, is now in service between Shell Chemical's Pittsburg, Calif., ammonia plant and a new Shell terminal at Portland, Ore. Shown here leaving Bethlehem Steel's shipyard at Beaumont, Tex., the vessel is 252 ft. long, has a capacity of 721,270 gallons.

Nine separate tanks are used, each designed for 250 psig. Seven of these are below deck, two above. (Three extra tanks were carried on deck during the voyage from Beaumont to Pittsburg for permanent installation in a smaller barge later.)

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BLOOD FOR TRANSFUSIONS . . . *banked for a year*

Imagine banking more blood in a year than has been shed by all American fighting men since Braddock's defeat.

That's how many red blood cells a new *Glycerine preservation process* promises to make available—from today's normal supply of donated blood.

Until now, it's been impossible to prevent red cells from spoiling after three or four weeks' storage.

But by suspending cells in Glycerine at subzero temperatures, scientists have successfully preserved them for over six months.

And banking for as long as one to three years—perhaps more—is a practical possibility.

The unique balance of properties that won such wide acceptance for Glycerine in the past continues to open *new* doors to chemical progress. In paints, foods, pharmaceuticals, packaging . . . for tomorrow's surge of new specialties . . . in formulations and reactions yet unknown. Nothing takes the place of Glycerine.

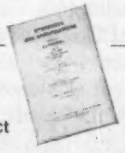
This balanced group of properties keeps **Glycerine's** usefulness growing

HYGROSCOPICITY • STABILITY • HUMECTANT •
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Two Expansions For Air Reduction

Confirming earlier plans, Air Reduction Co. has awarded a contract to the Lummus Co. for construction of a vinyl acetate monomer plant at Calvert City, Ky. The $3 million unit will have a capacity of 30 million lb. a year and should be finished early in 1956. Acetylene requirements will be met from an adjacent plant run by Airco's National Carbide Div.

In a second expansion, Airco's newly acquired Colton Chemical Div., which now has a plant in Cleveland, has acquired a plant site and building at Elkton, Md. These facilities are being converted for production of polyvinyl acetate emulsions and a new copolymer emulsion for use in PVA paints.

New Lithium Chemicals Plant Starts Running

A unique lithium products plant, able to process run-of-mine ore, has been put into operation by Lithium Corp. of America at Bessemer City, N. C. (see *Chem. Eng.*, June 1954, p. 106). Elimination of the usual concentration step for gangue removal means handling more than four times as much ore daily, but the company says improved efficiency that results makes it well worth while. However, provisions have been made for running concentrates, too.

Both lithium carbonate and lithium hydroxide will be made in the $7 million installation. Should demand for other lithium chemicals grow, carbonate will probably be sent to the company's Minneapolis, Minn., plant for further processing.

New Plant Will Make Stable Titanium Powder

Moving out of the pilot plant stage (see *Chem. Eng.*, Aug. 1954, p. 104), United International Research, Inc., of Long Island City, N. Y., is now building a "commercial" unit to utilize its new electrolytic process for titanium and titanium alloys. But although United will build and operate the plant, actual ownership is vested in an unnamed client (said to be a well-known maker of electrochemical equipment).

The new unit will cost $250,000 and is expected to produce 15,000 lb. a month of completely stable titanium powder from three cells. (This is quite small as commercial titanium plants go.) Completion is expected early this spring.

Reason for aiming at powdered metal rather than sponge, says United, is that it can be formed into parts by powdered metallurgy techniques with essentially no waste. Present fabrication methods using sponge require 4-5 lb. of metal to make a 1-lb. finished part. Conventional titanium powders—made by the hydride route—are highly flammable in air and can't be formed into parts by any conventional methods. United says its stable powder overcomes this.

Versatility Marks New Bleach Plant

St. Mary's Kraft Corp., a subsidiary of Gilman Paper Co., is now operating an unusual multistage bleach plant at St. Mary's, Ga. Chlorine dioxide is the main bleaching agent, but the five towers are designed so that different bleaching agents, or combinations of agents, can be used as desired.

Until now, bleach plants were restricted to one single system or sequence. Gilman's new flexible units make possible production of all degrees of brightness from semi-bleached to the highest possible—by a variety of processes.

Stauffer Will Expand Fertilizer Facilities

At Vernon, Calif., and later at Richmond, Calif., Stauffer Chemical Co. plans to boost fertilizer capacity. A million dollars will be spent at Vernon to build a 500 ton per day plant to produce pelleted superphosphate and high analysis mixed fertilizers. The firm will use its own new process, which includes innovations in both pelleting and wet-mixing.

Significance of the expansion is two-fold. First it marks Stauffer's entrance into high analysis mixed fertilizers. These plant foods can't be dry-mixed. They require relatively complicated wet-mixing equipment not usually available to small formulators.

In the second place, the move is tacit recognition of a distinct trend toward pelleted fertilizers in general. One instance of this is the growing interest in rangeland fertilization (10 million acres of open rangeland in California alone), which would mean big demand boosts for both phosphates and nitrogen.

News Briefs

Zinc oxide: Northwest Refining and Chemical Co., which plans to make commercial white zinc oxide by an improved process (see *Chem. Eng.*, Nov. 1954, p. 104), has started to build a small plant in Spokane, Wash.

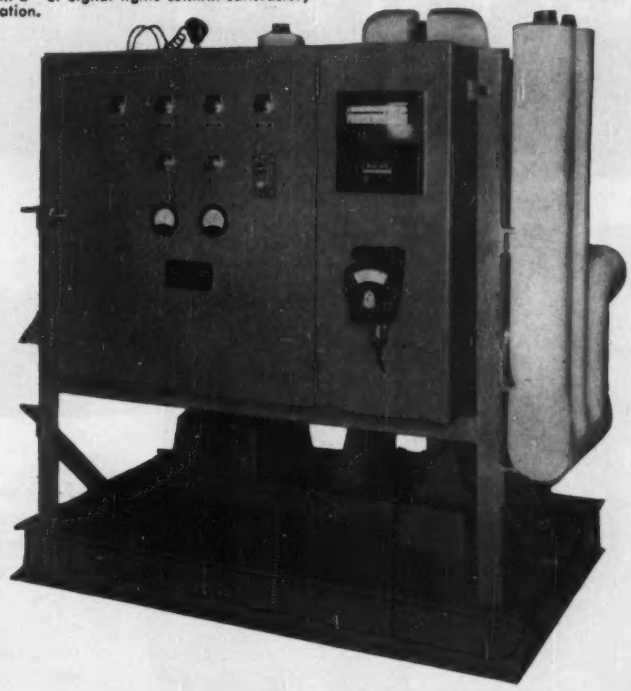
Heavy chemicals: W. R. Grace & Co., Farbwerke Hoechst A. G. and American Home Products Corp. have formed a new company—Fongra Produtos Quimicos S. A.—and will build a $5 million chemicals plant in Sao Paulo, Brazil. Main products will be DDT, solvents, detergents, caustic soda and chlorine. Completion is planned for 1957.

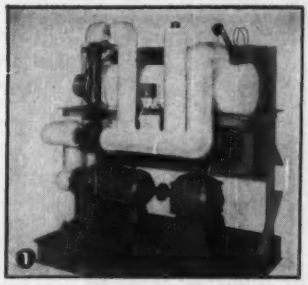
Water softener: Westvaco Mineral Products Div. of Food Machinery and Chemical Corp. has completed a 12-million-lb.-per-year sodium hexametaphosphate plant at Newark, Calif., the first on the West Coast.

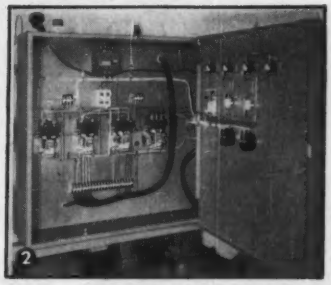
Oil chemical: Alaska Pine and Cellulose, Ltd., 80% of which was bought recently by Rayonier, Inc., has started building an $8 million plant at Port Alice, B. C. It will turn out a chemical bark extract (Rayflo), which is finding use in oil well drilling.

A COMPLETE TRANSFER OIL HEATING SYSTEM in one compact "PACKAGE"

Instruments and controls are substantially flush mounted. Temperature controls are carefully selected to maintain oil supply temperature within 2° C. Signal lights confirm satisfactory operation.







1. The system is compactly arranged to conserve space. To obviate leaks, pipe connections are welded wherever possible. The heavy pipe insulation is securely wired and wrapped with cemented canvas.

2. The workmanlike electrical system provides easy-to-trace circuits. All wire of high current capacity is heavy cross section.

WHITLOCK has developed a standard "package", with ratings of 10 to 50 KW, which includes heater operating controls and expansion tank to heat chemically stable transfer oils. Since these oils are liquid over considerable temperature ranges, they are being used increasingly in chemical processing operations. The heating equipment, previously of special design, is now available as a complete, standardized unit to which only oil and electrical connections need be made in order to permit immediate operation.

The combination of low liquid pressures and high liquid temperatures eliminates the need for the application of high pressure design techniques to many current processes. This new "package" effectively serves to reduce overall equipment costs and to simplify process design.

For additional information and prices, write The Whitlock Manufacturing Company, 94 South Street, West Hartford 10, Conn. In Canada: Darling Brothers, Ltd., Montreal.

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Designers and builders of bends, coils, condensers, coolers, heat exchangers, heaters, piping, pressure vessels, receivers, reboilers

2 Stock Answers for



Farris X-V Series

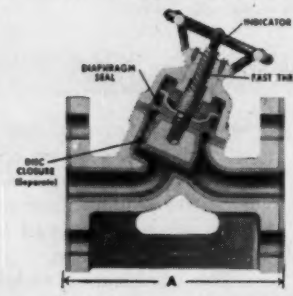
This versatile, dependable, economically-priced hand valve is equally at home in corrosion, abrasion, vacuum or general service—wherever positive action is needed. The X-V Series disc—for positive closure—and diaphragm—for positive sealing—work independently, with only the disc exposed to pressure in the closed position, substantially increasing diaphragm life, lowering torque and providing unsurpassed vacuum service . . . No other valve does such a complete job at so little cost!

Write for Bulletin FL-154



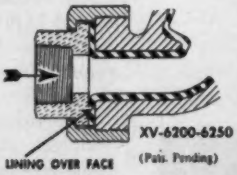
DISC for positive closure

DIAPHRAGM for positive sealing



NEW

Corrosion Resistant Union Ends



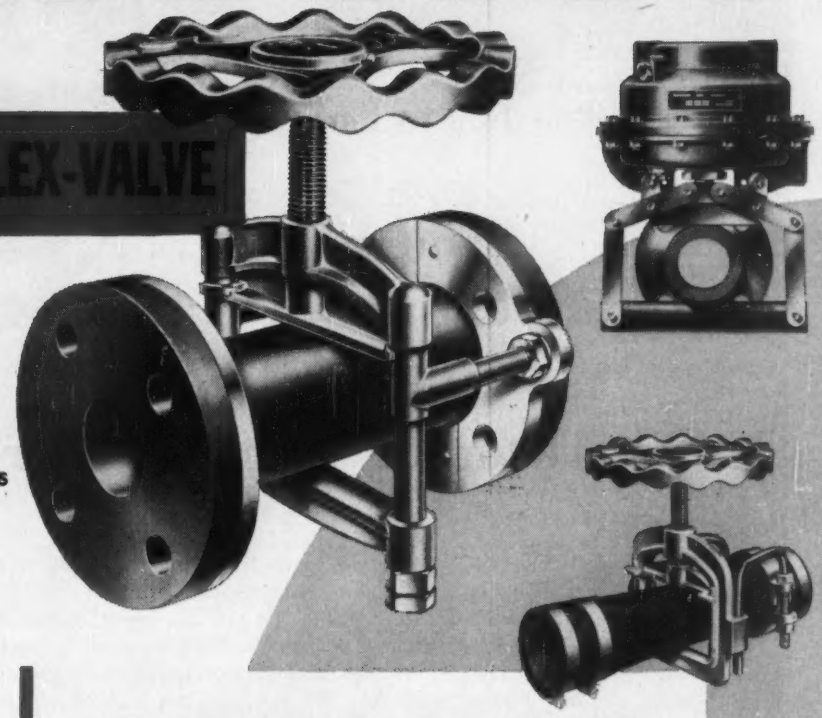
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X-V Series Design Features

- Realistically-Priced for Low-Cost Service
- 50% Greater Capacity than Similar Type Valves
- Only Disc Area Exposed to High Vacuum in Closed Position
- No Packing Gland to Leak. Mechanism Not Exposed
- Low Hand-Wheel Torque... Easy to Operate
- Available in Lined or Unlined Models...With Corrosion Resistant Union Ends.

Tough Valve Problems

Farris Pinch-type FLEX-VALVE



No other valve controls the flow of hard-to-handle corrosive and abrasive materials with the efficiency and reliability of the Farris Pinch-Type FLEX-VALVE . . . because FLEX-VALVE cannot plug! This is the simplest valve made—only two components—employing the fundamental principle of pinching off the rugged, flexible valve body. Case histories show batteries of these valves in severe service for more than 20 years—and still going strong!

For complete information write for Catalog FL-382

YOUR MONEY BACK IF IT PLUGS!

Flex-Valve's Exclusive Advantages

- Will Outwear Any Metal Valve in Abrasive Service
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- Maintenance Free
- Bubble Air-Tight
- Low Replacement Cost
- No Obstructions, Pockets or Internal Parts
- Available in Rubber, Neoprene, Butyl, Buna-N, Buna-S, Food Stock and Special Compounds.
- Air or Hand-operated Types

Farris

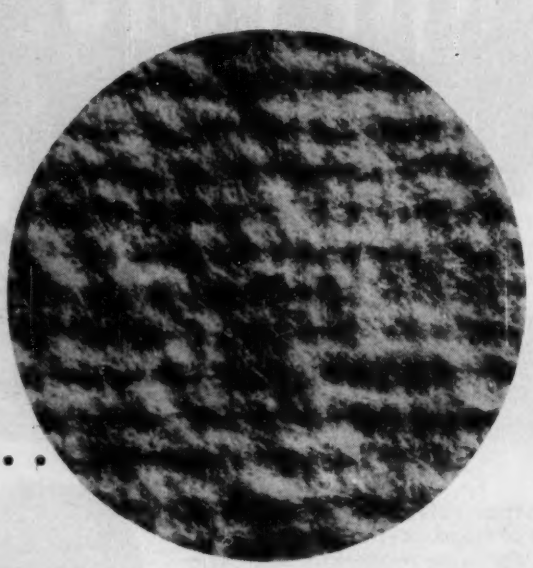
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There is only one FLEX-VALVE

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Synthetic Fibers and Synthetic Resins Join to Form



Tough Felts . . .

Try Them for Your Filter Problems

FILTRATION with felt—ever thought about it? Not the green stuff on the billiard table, or the industrial wool felts that have been around quite awhile, but a tough, non-woven fabric made of staple synthetic fibers meshed tightly together by pressure and a resinous binder.

If you're a cotton filter cloth user you can now have a felted material in nylon, Dacron, Dynel—maybe Orlon, soon—a filter media that has most of the virtues of these synthetics, yet costs you less than it would in woven form. This means, too, that if you already use woven synthetics in your filtration operations, non-woven felts can actually save you money. Pound for pound, felt cloth of staple fiber is basically cheaper than woven cloth, be it of staple or filament fiber.

Felts offer operating advantages, too:

• A synthetic felt's tight, pressed structure retains smaller particles than many finely woven cloths of same weight.

• At the same time, a felted fabric has by its very nature a high porosity (as much as 70% voids), gives comparable flow rates.*

• You can easily and quickly fabricate felt filter cloth on the job. Its non-woven structure enables you to cut edges and holes cleanly, with no frayed ends or raveling.

• Felts need no preshrinking. They hold their size and shape on filtration equipment, won't give you sealing, hole-aligning troubles.

▶ **What Do They Cost?**—Brosites Products Corp., New York, N. Y., probably the most active promoter of nylon and Dacron filter felts, sells nylon staple felt (uncut) for about $2.65/sq. yd. (10 oz.). Standard woven staple nylon cloth on the market will cost, on an equivalent basis, $3 or more. Woven filament fiber may run 30% higher. Any sort of trick weave will, of course, cost more.

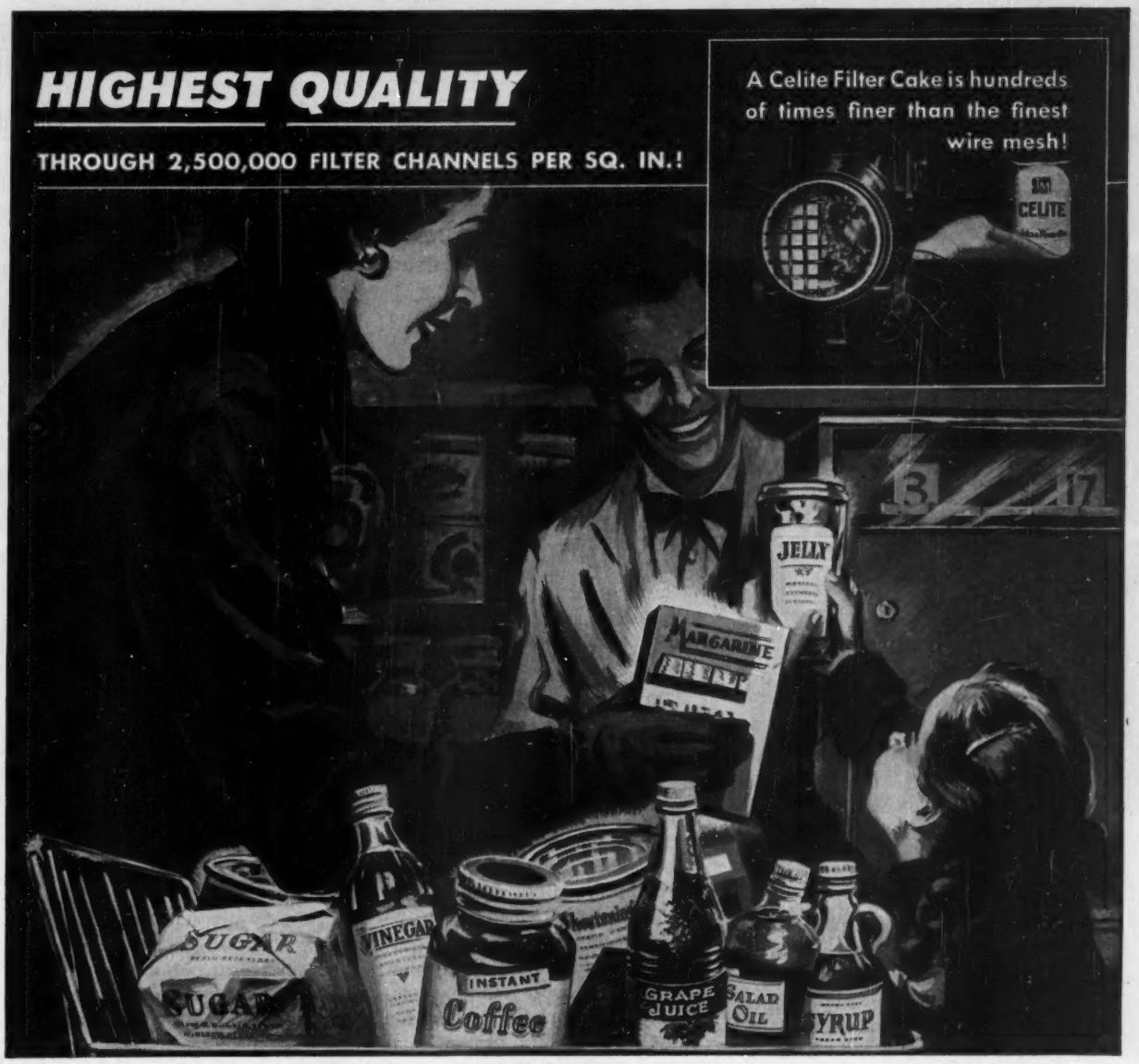
It's true cotton is much cheaper, runs about $1.10/yd. for 15 oz. duck material. But it may have such limited service life and utility as to make it less economical than felt in the long run. Felts can give filtrations that require two thicknesses of cotton . . . and last longer. A 10 oz. felt handles activated carbon on a par with a 32 oz. cotton cloth.

How strong are these felts, you ask? They may be a synthetic fiber filter medium in a cheaper form and have all these operating advantages, but can they stand up to reasonable operating pressures and handling?

Brosites feels they can. Brosites won't say it's felts, called Filtaweb Felts, are fully as strong as all woven fibers of the same weight*—they shouldn't, for instance, be machine-washed—but is confident that they're rugged enough to do plenty of the jobs that need a synthetic filter medium. A 0.03-in. thick, 10-oz. per sq. yd. nylon felt has a 335 lb. per 2-in. width breaking

* A hard thing to measure. Filter-cloths function more as media supports than as media themselves—the solids you're filtering do most of the job. But filtration men agree that for the same solids retention—i. e. particle size holdup—a felt gives better flow rates than woven cloth or, putting it another way, better filtration at equal flow rates.

* Another tough comparison. Woven fabrics come in an endless variety of weaves: square, Leno, twills, chain, drill, sateen, to name a few—all with different strengths, as well as other physical characteristics. It's like trying to compare apples with spinach, beans and cabbage.



Celite Filtration assures perfect clarity—

adds eye appeal and buy appeal to food products

TO GIVE foods and beverages that extra quality which results in more sales appeal, leading processors depend on Celite Filtration. The Celite method provides perfect clarity at high production rates.

Celite Filtration is *efficient.* It removes even the finest suspended solids. Moreover, Celite Filtration is *economical.* It may be used with any type of conventional filter, it is almost automatic, and only unskilled labor is required for routine operation.

And Celite Filtration is *flexible.* To meet your specific requirements, Celite comes in nine standard grades of microscopically controlled particle size. The right balance between degree of clarity and rate of flow may be easily controlled. You can obtain perfect clarity in food products—highest purity in antibiotics—complete removal of insoluble impurities from water, petroleum, chemicals, dry cleaning solvents and many other liquids.

A Johns-Manville Celite Filtration Engineer will gladly discuss the advantages and use of Celite in your product or production process. For his services, without obligation, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ontario.

•Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville CELITE INDUSTRY'S STANDARD FOR FINEST FILTRATION

Products on these pages this month made news . . .

Page number is also Reader Service code number

Tough felts for your filter problems.....138A
High-temperature insulation 142A
Polyvinyl alcohol fiber.....142B
Dry photo process.....144A
Lysine 144B
Synthetic 'natural' rubber.....144C
Well-injection aids.....144D
Plastic "steel".....144E
Carbon black for polyethylene pipe.....146A
Chlorinated solvent for small industry use..146B
Refined, uniform petroleum wax.....146C
Two insecticides for cotton growers.....146D
Epoxy resin adhesive.....146E
Styrene for synthetic rubber.....146F
Fermentation product is nutrition factor...146G
Fireproof storage.....146H

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strength, a 390 psi. Mullens brusting strength.

►**In the Carding**—Ordinary felts, formed without a binder by the matting together of short fibers, have a rather rough texture, will give a "depth" rather than a surface filtration. Filament fibers are carefully aligned before weaving, present a smoother, more easily cleaned surface.

There's something of both techniques in the manufacture of Brosite's felts. Fibers are carefully crosscarded—aligned in two directions for overall strength and evenness—and then pressed together with a binder. Result: a tight, smooth fabric which, says Brosites, supports a filter cake almost entirely on the felt's surface, resists clogging of interstices, releases easily from most materials.

A premium grade, with a very smooth, almost slick "eggshell" finish on one side, is available, too. This gives maximum cake release and cleaning ease, yet retains its permeability.

Some of Brosites' case histories:

• A pharmaceutical processor had used 15 oz. woven nylon cloth on a 24-in. plate and frame press to filter a fine inorganic crystal from an alkaline organic solution. Enter Brosites' felts: cake removal easier, costs reduced 45%.

• A pigment manufacturer found Dacron felts, costing 40% less than woven synthetic cloth used before, gave as good a filtration on a 30-in. plate and frame press with faster cake removal. And, by virtue of their stiffness, the felts held their place between plate and frame, made it easier to close the press.

• A food processer was using cotton cloths to filter flavored syrups, found it necessary to wash them daily. Troubles: shrinkage, unraveling and misaligned holes. Felts, washed down with hot water on the press, did not shrink, lasted longer, gave a better filtration.

Not history yet but under test: separation of anode sludges from electrotyltic copper refining solutions (woven cloth proves too brittle); removal of carbon from fumaric acid solutions (pressure of sealing edges of steel plate and frame press had cut previously used woven filter cloth).

Although most work by Brosites and others felt suppliers has been with plate and frame filter presses, adaptation to rotary equipment is under hopeful study. One reason for optimism is the known use of wool felt on rotary vacuum filters in sewage treatment work. Some people, however, question whether a synthetic felt will take the scraping action of a rotary's doctor blade, or will release the filter cake readily by string discharge.

Actually filter felts are not do-alls. They're not all purpose substitutes for woven material, natural or synthetic. But they do provide the chemical processor with a new class of filter medium—one that should get more and more consideration.

For in a field as full of specialized problems as is filtration, full of different fabrics tailored to solve

Profile of Filter Felt Properties

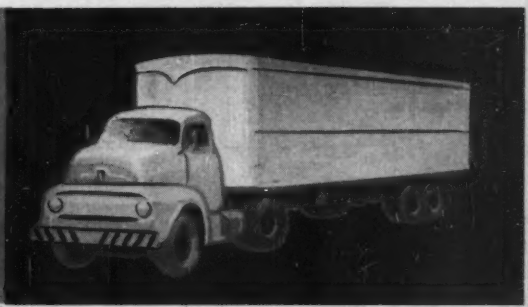
	Dacron	Nylon
Weight, oz./sq. yd.	10	10
Thickness, in.	0.026–0.035	0.030–0.045
Breaking strength, lb./2-in. width	243–129	335–175
Mullens bursting strength, psi	350–290	390–280
Elongation, % to rupture	52–65	70–82
Density, lb./cu. ft.	51–38	45–30
Porosity, % voids	43–64	59–72
Shrinkage, % at 200 F	0	0
Air permeability, cfm./sq. ft./0.5-in. H_2O	2–17	2–13
Flow rate (water), gph./sq. ft./8-in. head	180–2,170	180–1,800

Note: Data are for Brosites' felts

Heyden Salicylic Acid

by the truckload...

by the drum...



in the right form

to fit your needs...



U.S.P. CRYSTALS

A product of extremely high purity. Valued as an intermediate for the manufacture of aspirin and salicylates.

U.S.P. POWDER

Used in dusting powders, lotions and ointments for its antiseptic, fungicidal and keratolytic properties.

TECHNICAL CRYSTALS

An exceptionally pure technical sublimed product used in rubber and as a chemical intermediate for dyes and essential oils.

H POWDER

An economical unsublimed grade suitable for use in organic syntheses, rubber, and other technical applications.

We shall be happy to consult with you on your Salicylic Acid needs.

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Crystals or Powder

POTASSIUM SALICYLATE
Powder

METHYL SALICYLATE U.S.P.

PHENYL SALICYLATE N.F.
Granular (SALOL)

ACETYLSALICYLIC ACID U.S.P.
Crystals or Powder
(also Starch Granulations)

FINE HEYDEN CHEMICALS

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Parahydroxybenzoates • Pentaerythritols • Propyl Gallate • Resorcinol • Salicylates • Salicylic Acid • Sodium Benzoate

those problems, synthetic felts can't help but find plenty of jobs to do.

▶ **Teamwork**—Brosites Products, a three-year outgrowth of the thirty-year old Brosites Machine Co., has been in the industrial filter paper business three years, moved into felt work about a year ago. Brosites doesn't manufacture the felt product but supplies the filtration know-how and sales organization in a joint venture with one of the biggest U. S. felt manufacturers. Other felt makers, too, are showing interest in this new market for their products, by working with such filtration outfits as Filtration Engineers, Newark, N. J. 138A



Crude Oil Transfer Line Gets Insulation Icing

Industrial processes, moving into higher and higher average temperature zones, need better and better insulation for process control, to conserve fuel and protect operating personnel.

Two varieties of this insulation for stepped-up processing are Fiberglas (effective to 900 F.) and Kaylo (hydrous calcium silicate, effective to 1,200 F.) pipe and block insulations. Photo shows a workman putting the finishing touches to a Kaylo-insulated transfer line which carries 700 F. crude oil from furnace to fractionator.

Already used on such refinery equipment as piping, stripping towers and desalting tanks, Kaylo and Fiberglas are moving, also, into construction of atomic power plants. They'll go into two atomic steam plants at Kyger Creek, Ohio, and Clifty Creek, Ind., under the terms of what may be the largest insulation contract in the electrical industry's history.—Owens-Corning Fiberglas Corp., Toledo 1, Ohio. 142A

Polyvinyl Alcohol Fiber

From Japan, competition for cotton: 15 million lb./yr. of PVA fiber.

Knocked about in half-hearted research here and there for nearly thirty years, polyvinyl alcohol fiber —known generically as vinylon—is catching on now in Japan (*Chem. Eng.*, Jan. 1955, page 108-110). A low priced synthetic with some attractive properties, it is forcing attention from the world's textile interests.

Kurashiki Rayon, vinylon's biggest producer, is turning the synthetic out at a 20 ton/day clip, expects Japanese output to top 65 million lb./yr. by 1957. Price is coming around, too: first it was 84¢/lb., now it's 70¢/lb., soon it may be 50¢/lb.—low for a synthetic. Target: cotton's 35¢/lb. tab.

Unlike other synthetic noncellulosics, vinylon soaks up water to the tune of 30%, can thus aspire to replace cotton in underwear, sheets and similar materials where a fiber is in contact with the body. But severe damp ironing of vinylon goods—above 120 C.—still poses a problem.

Another vinylon feature: polyvinyl alcohol itself is water soluble, good news to the fiber maker since spinning from a water solution is both economical and simple. (Kurashiki's process insolubilizes the spun fiber by acetalization with formaldehyde).

Big push behind vinylon's promotion stems from belief that the world needs, most of all, an inexpensive synthetic fiber to replace natural fibers that are all too sensitive to the whims of nature. If it's price can be hammered well below 50¢ a lb., vinylon could be that fiber.—Kurashiki Rayon Co., Toyama, Japan. 142B

For More Information . . .



about any item in this department, circle its code number on the Reader Service Postcard inside the back cover.

B&A Chromium Fluoride (TECHNICAL) is the Best Buy You Can Get!





...and here's why!

A glance at the specifications tells you that Baker & Adamson Chromium Fluoride, Technical, has an unusually high assay. It tells you that B&A Chromium Fluoride is extremely low in heavy metal impurities. But that's only half the story . . .

B&A Chromium Fluoride is also an *especially dry, free-flowing* product, offering superior physical characteristics that assure better process performance.

For samples that will quickly prove its merits or for further technical data on this "B&A Quality" fine chemical, just mail in the handy coupon.

Typical Analysis:

Chromium (Cr)	30.5 %
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CrO_4 (as Cr)	0.01 %
SO_4	0.05 %
Cu	0.015%
Pb	0.005%
Fe	0.05 %

Screen Size:

Thru 40 mesh	99.9 %
Thru 100 mesh	95.0 %

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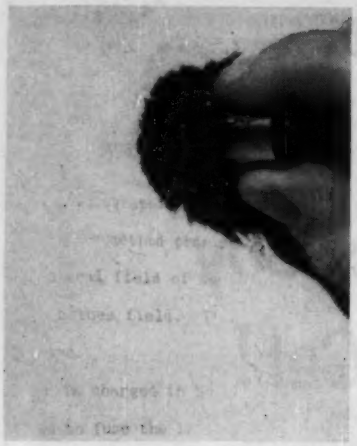
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Dry Photo Process

Low cost, coated paper makes contact prints at exposures of a fraction of a second.

Although as sensitive as standard photo contact printing paper, Electrofax paper costs no more than low sensitivity papers commonly used for reproduction of diagrams and plans.

Speed with which images are photographed and printed—in a few seconds—with the Electrofax paper and processing technique suggests two possibilities: a mechanized system of continuous strip reproduction for use with electron computers and like devices; a practical, inexpensive production of master copies of letters, diagrams, microfilm, etc.

Electrofax paper owes its utility to a thin layer of zinc oxide in a resin binder, insensitive to light until given a negative charge. Light falling on the sensitized paper will then reduce the electrostatic charge—the reduction depending on the light intensity—leaving an electronegative image of varying strength on the surface.

Now a magnetic brush sweeps across the paper, depositing positively charged resin pigment powder to form an image according to the negative charges on the surface. Baking for a few seconds achieves permanency—the resin powder melts and fuses to the coated surface.—**Radio Corporation of America, New York 20, N. Y.** 144A

Lysine

A key amino acid, which boosts protein value of food, is synthesized.

The eight amino acids, essential to human nutrition, must be present in food in the right proportions for the body to receive full benefit from proteins it consumes. Lysine, one of the "critical eight", is often found lacking in many foods, notably those based on wheat. Announcement of successful production of synthetic lysine—albeit in limited quantities—is, then, significant news.

It means processors can get the "right combination" of essential amino acids in many foods with low available protein values by adding small quantities of newly available synthetic lysine. Tests show, for example, that 0.2% lysine added to wheat flour boosts available protein in bread by 70-100%.

However, until manufacturing facilities can be expanded, supplies of lysine to food manufacturers, pharmaceutical firms, nutritionists and research groups will necessarily be limited.—**E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.** 144B

Synthetic 'Natural'

Promises price stability for imported rubber, self-sufficiency in an emergency.

The recently announced successful duplication of the natural rubber molecule is more than a scientific triumph. It will effectively place a ceiling on the price of imported tree-grown rubber and could eventually make the U. S. independent of foreign rubber in an emergency.

All this, even though presently existing government-owned synthetic rubber plants can't produce the man-made "natural" rubber which, regardless of point of manufacture, will cost a good deal more than synthetic GR-S rubber at 23¢ a lb.

Not that GR-S would be supplanted, even at competitive prices. For GR-S is better for many uses than crude, or tree, rubber and accounts for more than half the new rubber consumed in the U. S.

Indeed, all rubbers—natural or synthetic—have their place; each is better for some things than the other. It's good to know we can make both, now. **Goodrich-Gulf Chemicals, Inc., Pittsburgh 30, Pa.** 144C

Well Injection Aids

Quaternary ammonium compounds kill sulfide-producing bacteria, help open oil sand.

Certain sulfate-reducing bacteria generate H_2S in water used in flooding secondary oil recovery operations. Two results: precipitated iron sulfide plugs up the oil-bearing sand, causes water injection rates to drop, pushes pressures up; extra corrossion caused by H_2S.

A mixture of two quaternary ammonium salts of amines, one a bactericide, the other a corrosion inhibitor, eliminates bacteria and reduces the bacteria-caused corrosion by 95%.

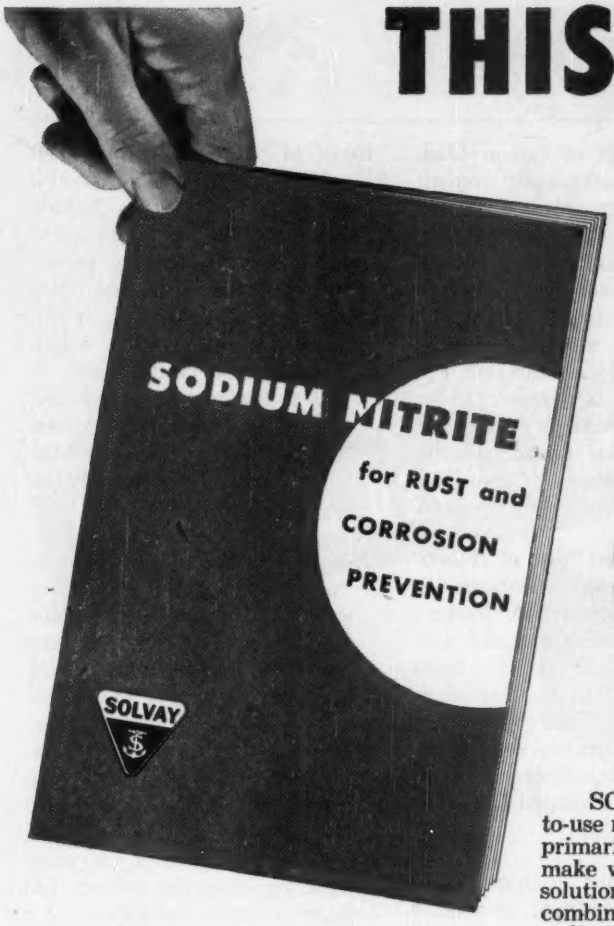
Called Arquad T 2C, the mix is being used successfully at reasonable cost—1 to 3 mills per barrel of oil—in 27 flooding jobs in Illinois, Indiana and Kentucky; in the largest flooding operations in Oklahoma; in the brine waters of Kansas and west Texas; and even in the clay swelling sands of California.—**Armour & Co., Chicago 9, Ill.** 144D

Plastic "Steel"

Pliable as putty, it hardens in two hours to a rigid mass that can be sawed, drilled and machined.

Take Devcon, a pasty mixture of 80% powdered steel and 20% plastic, add a dash of hardening agent, stir the mixture and press or pour into the shape you want. Watch it harden in two hours without heat or pressure to a rigid, steel-like mass.

It's that simple, say the makers of this new compound that's based



THIS NEW BOOK

Tells How To

CONTROL or PREVENT RUST and CORROSION with SOLVAY SODIUM NITRITE

and

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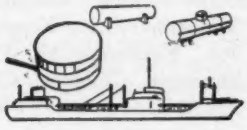
SOLVAY Sodium Nitrite provides a low-cost, safe and easy-to-use means of protecting many metals from rust and corrosion, primarily iron and steel. Dilutions as low as 1/10th of 1% will make water solutions non-corrosive; and 3 to 5% spray or dip solutions will produce protective films on metal surfaces. When combined with materials such as phosphates or caustic soda, sodium nitrite's protective action can be extended or obtained during cleaning, neutralizing or similar operations.

This new booklet contains detailed information on how SOLVAY Sodium Nitrite prevents rust and corrosion, and how its protective action can be utilized, either alone or in combination with other materials. It also contains an extensive bibliography covering 59 published papers on the use of sodium nitrite and nitrite compounds for corrosion prevention.

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on a special cold-thermosetting resin. And here's what the stuff can do:

• Fill holes in castings, build up metal parts.

• Cement steel, aluminum, bronze, brass, cast iron and even porcelain.

• Get a broken drill bit out of a costly casting. A few dollars worth of Devcon will make a guide through which cutters can be aimed at the piece to be removed.

• Make small machining fixtures like drill jigs.

• Make forming dies for a home radiator top. Cost. $22 worth of Devcon plus $2 for labor. (A steel forming die will cost $450). —**Chemical Development Corp., Danvers, Mass.** 144E

Fireproof Storage

Insulation withstands open 1,600 F. flame test.

A compounded fireproofing insulation for storage vessels stood up to simulated fire testing recently at Villanova College. Although calculated specifically for liquefied propane in storage, results would seem to recommend the insulating material for tanks holding many other inflammable materials.

Test tanks were designed in such a manner that the area of the end exposed to a direct 1,600 F. flame bore the same relationship to the volume of the liquid in the test tank as would prevail in full sized, 30,000-gal. propane tanks enveloped in flame.

Test results for a 2-in. insulation: insulating efficiencies of 94%; heat transfer coefficient of 0.8 Btu./sq. ft./hr.; temperature rise of only 100 F. in three hours—all quite acceptable.

Composition of the coating: $\frac{1}{16}$-in. base coat of corrosion resistant palladium Type T or T2 Mastic; $1\frac{1}{8}$-in. (minimum) layer, next, of asbestos and ceramic material supported by wire mesh; finally, a $\frac{1}{8}$-in. overcoat of weather resistant palladium Type T or T2, with or without optional glass fibre membrane.—**Emjay Maintenance Engineers, Rutherford, N. J.** 146H

Briefs

Higher loadings of carbon black will increase the burst strength of polyethylene pipe. Researchers are still scratching the surface, won't say just how much. But they hope to develop enough additional strength to make the pipe much more competitive with steel. Idea came from the use of black to reinforce rubber polymers.—**Acheson Dispersed Pigments Co., Philadelphia 34 Pa. and Godfrey L. Cabot, Inc. Boston 10, Mass.** 146A

One of the least toxic of chlorinated solvents is Chlorothene (1,-1,1-trichloroethane). A "bucket" solvent for oil, grease and dirt, it's tailor-made for the small industry or business that needs only a few gallons of cleaning solvent a month and can't afford specialized equipment for handling.—**Dow Chemical Co., Midland, Mich.** 146B

A highly refined, uniform petroleum wax, designed to prevent surface checking and cracking of rubber products, is Sunoco Anti-Chek. Since it's a primary product, not a blend of waxy byproducts from lube oil production, Anti-Chek should give the same predictable performance—the same migration of protective wax to the rubber surface—from batch to batch.—**Sun Oil Co., Philadelphia 3, Pa.** 146C

Insect-plagued cotton growers will have two new and powerful insecticides for use in 1956 if early field successes are confirmed in more extensive testing. Both prove deadly to such pests as the boll weevil, cotton aphid, pink bollworm, and spider mites. Compound 16259, at a one pound an hour rate, gave 100% boll weevil control in June, 96% in October (weevils are tougher then). Toxaphene at two pounds an acre, on the other hand, gave only 66% and 54% weevil control in June and October, respectively.—**U. S. Department of Agriculture, Washington 25, D. C.** 146D

Equal in tensile strength to soft solder is the claim for a new epoxy resin adhesive, Araldite 115. The Army uses it in place of soft solder for bonding galvanized steel screens to cold rolled steel shrouds in bomb tail-fin assemblies. Araldite may reduce this operation cost by 50% as well as save critical tin and lead, according to the Army.—**Business and Defense Services Administration, Dept. of Commerce, Washington 25, D. C.** 146E

Now that synthetic rubber production is nearing a shift from government to private hands, the 0.02% sulfur-containing styrene monomer that goes into making the rubber is turning, too. Three of it's major producers, Dow, Koppers and Monsanto, announced availability of the synthetic rubber grade styrene to industry at 18¢ a lb.—a 3¢ a lb. price advantage over the purer commercial grade styrene (no sulphur) used by industry for some time. Lower purity styrene is believed suitable for any application—essentially synthetic rubber end-uses—save polystyrene manufacturers.—**Dow Chemical Co., Midland, Mich.; Koppers Co., Inc., Pittsburgh 19, Pa.; and Monsanto Chemical Co., St. Louis 4, Mo.** 146F

An unidentified nutrition factor increases growth of swine and poultry beyond levels obtained with antibiotics and other growth stimulants. Tested on more than 100,000 animals, the fermentation product—called the Vigo Factor—sparks weight gains of 15-20% over those recorded for base rations.—**Chas. Pfizer & Co., Inc, Brooklyn 6, N. Y.** 146G

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about any item in this department, circle its code number on the Reader Service Postcard inside the back cover.



50 Years have changed a lot of things!

...including DUST CONTROL

To merely say, "Times Have Changed," regarding the stereoscope of Granddad's day and the TV of today would surely be an understatement. *Times Have Changed* . . . so have industry's methods.

Dust control methods have changed drastically during the past few years and we have played our part in changing them with a new concept, a new design in dust filtering. The DAY High Pressure, Reverse Jet Dust Filter manufactured under DAY and Hersey patents is a real departure from "yesterday's" type filter. The DAY advanced type Dust Filter is progress for industry. It saves valuable plant space because it requires a smaller unit to handle more dust laden air. It saves valuable time because it is pre-assembled at the factory and installation time is cut to a minimum. New facts about modern dust filtering are fully disclosed in a folder which is free to you. Write toDAY for Bulletin 528R.

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DAY High Pressure Reverse Jet Filtering has been used by leading companies for 5 years. 87% of DAY Filter users have ordered additional DAY Filters. The DAY organization is nation wide and ready to serve you and counsel you on any dust problem. **Write for our Bulletin 528R.**

DAY SINCE 1881



Cutaway view of the DAY Dust Filter—available housed or unhoused—for use on either vacuum or pressure. (Licensed by H. J. Hersey, Jr.)

The DAY *Company*

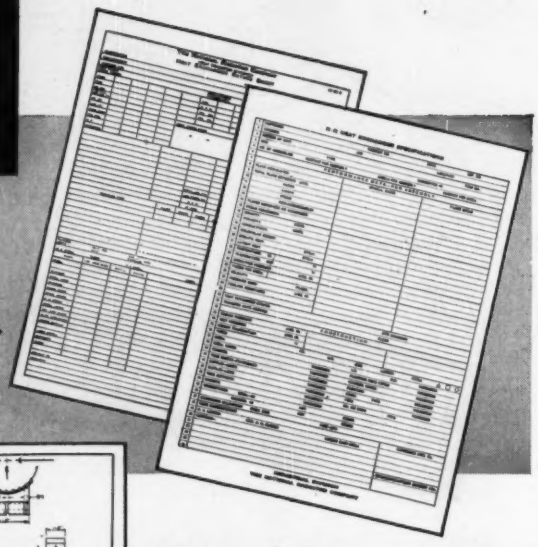
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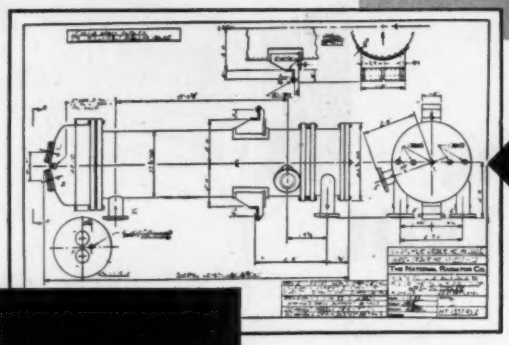


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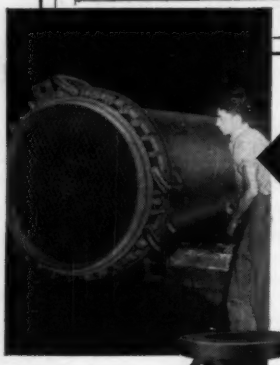


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through latest design to highest standards





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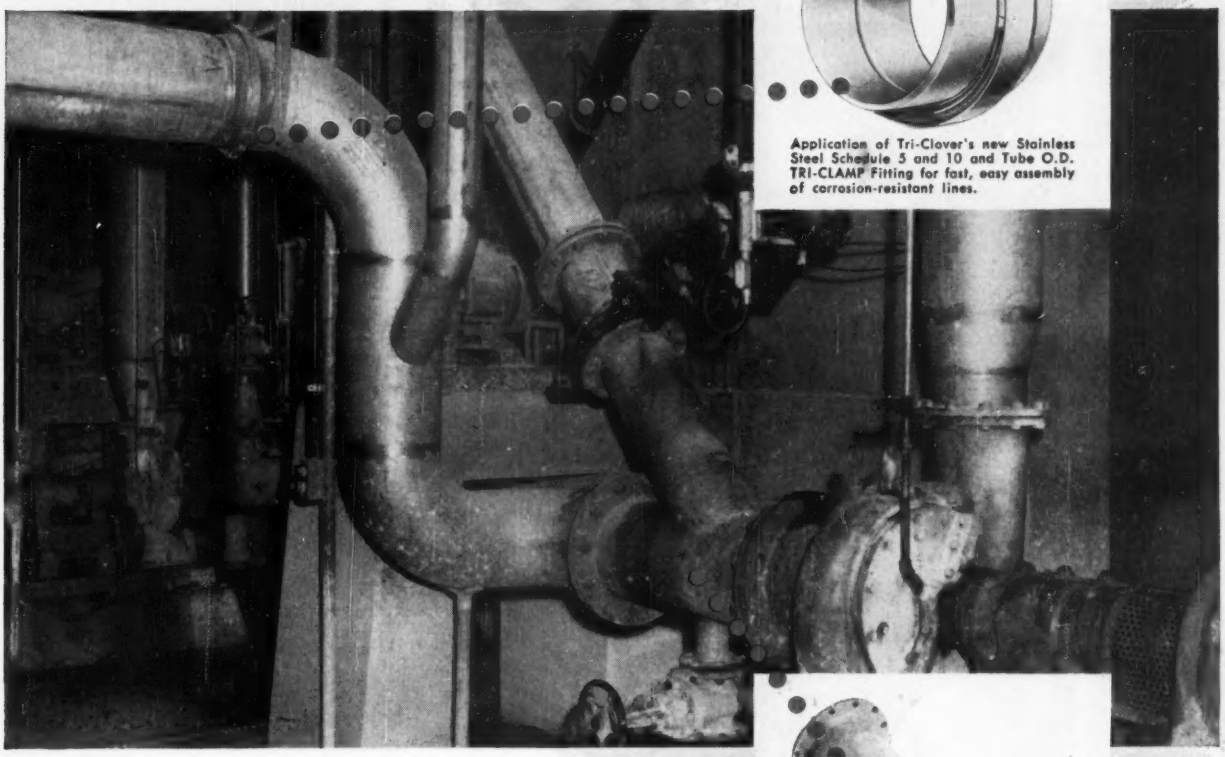
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Complex piping problems easily solved with "Standard"

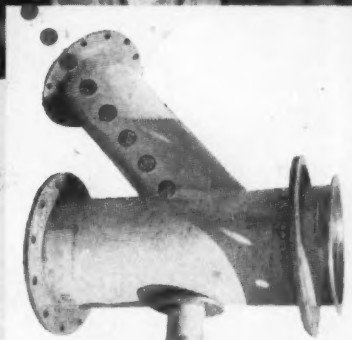
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Application of Tri-Clover's new Stainless Steel Schedule 5 and 10 and Tube O.D. TRI-CLAMP Fitting for fast, easy assembly of corrosion-resistant lines.



"Standard" Tri-Clover Stainless Steel 45-degree Lateral Fitting designed for flanged assembly . . . one of a complete line of industrial fittings for every purpose, in sizes up to 36" O.D.

● Shown here are part of the stainless steel fittings manufactured by Tri-Clover to meet the requirements of a large Midwest Paper Company. The units shown above are part of the Vortrap assemblies, and include Tri-Clover "standard" stainless steel fittings to provide maximum corrosion-resistance.

Experience and craftsmanship make the big difference in the production of long-lasting, fully corrosion-resistant fittings. That's why more and more mills and plants in the chemical-process industries are specifying TRI-CLOVER . . . for the highest quality stainless steel fittings, pipe, tubing and pumps.

LADISH CO.

Tri-Clover Division

Kenosha Wisconsin

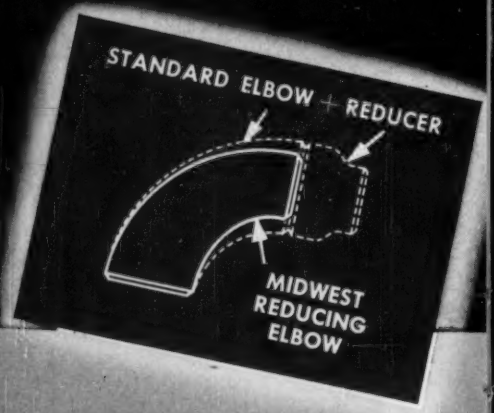
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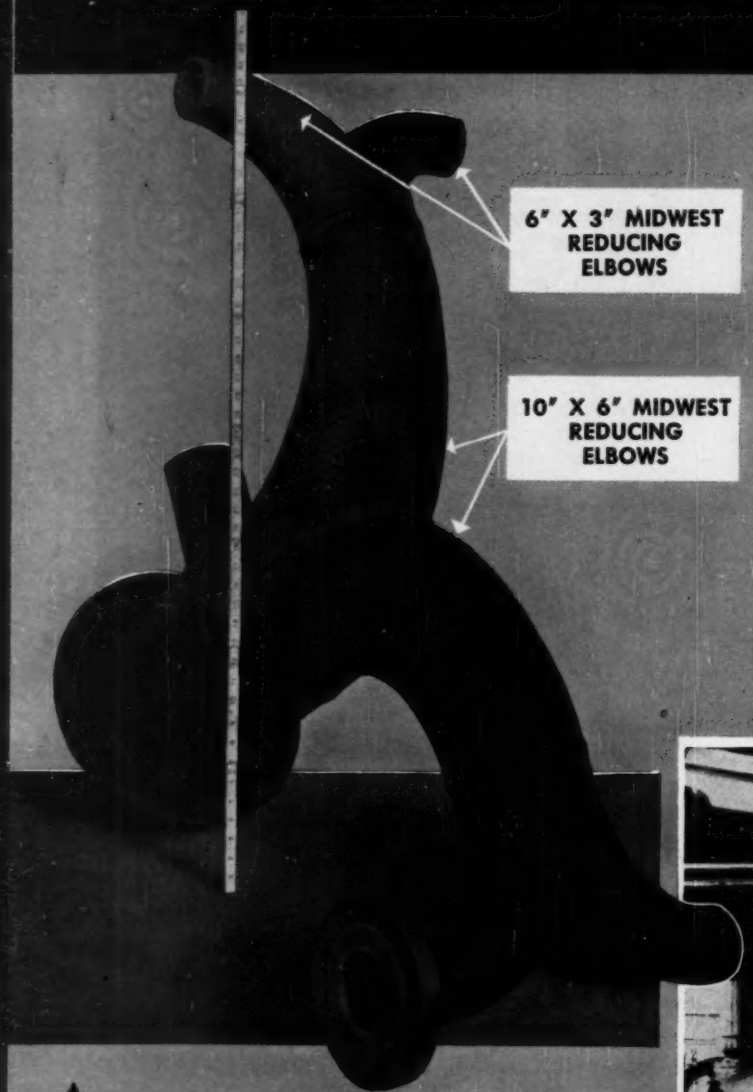
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1155

Better Piping at a Better Price

by Using MIDWEST REDUCING ELBOWS



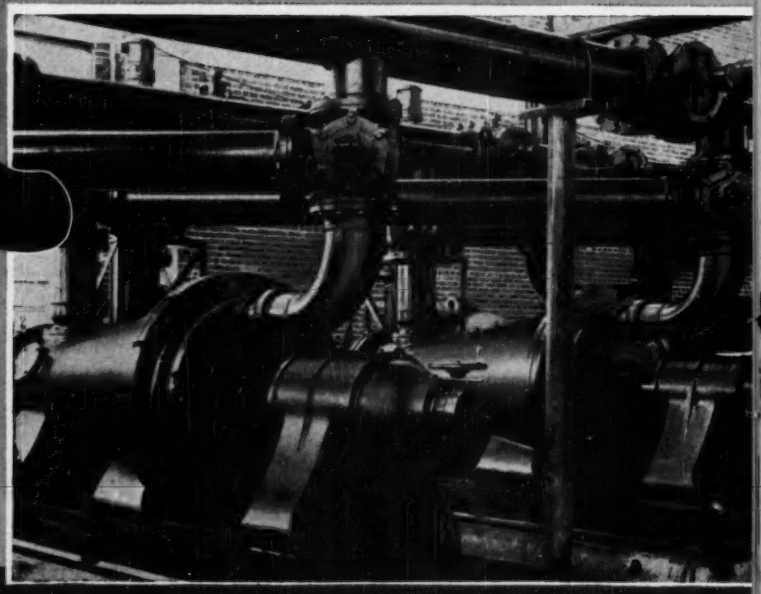


The Midwest Reducing Elbow offers important advantages in both piping design and piping cost. It needs only two welds instead of the three required by a standard elbow and a reducer (see sketch above). There is also a saving in layout time. Turbulence and pressure drop are reduced by the gradual taper . . . less space is needed . . . insulation is easier . . . and piping appearance is improved.

Only Midwest Reducing Elbows are available from stock in sizes to 16" . . . larger on special order. They have the same dimensional accuracy, uniformity of wall thickness, exact included angle and true center-to-end dimensions of Midwest Straight Elbows. For further information, ask for Catalog 54.

6999

↑ Midwest Reducing Elbows made it possible to fabricate this transformation piece for a boiler feed suction line so that it could be installed in the limited space available and still get the benefit of streamline flow. There was also a cost saving in comparison with a less efficient and bulky assembly made with straight tees, ells and reducers.



→ Paper stock flows with minimum resistance through Midwest Reducing Elbows from 8" connection on Jordan to 10" header. Other advantages over standard elbow and reducer: a saving in cost and space, and improved appearance.

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Why pay a premium for protection in your new processing equipment? Lukens Clad Steels—stainless, nickel, Monel, Inconel, copper—give you all the advantages of these solid high-alloys with savings up to 50% in material costs.

When you're thinking of new tanks and vessels, *qualified* equipment builders can assist from the earliest stages of planning. Working with your engineers and consultants, they know how to help minimize first cost and assure trouble-free equipment life with clad steel. We offer the widest range of clad steels available and work closely with fabricators to help select the type most suited to your processing needs. If you would like further information, ask one of your builders or write Manager, Marketing Service, Lukens Steel Company, 749 Lukens Building, Coatesville, Pennsylvania.

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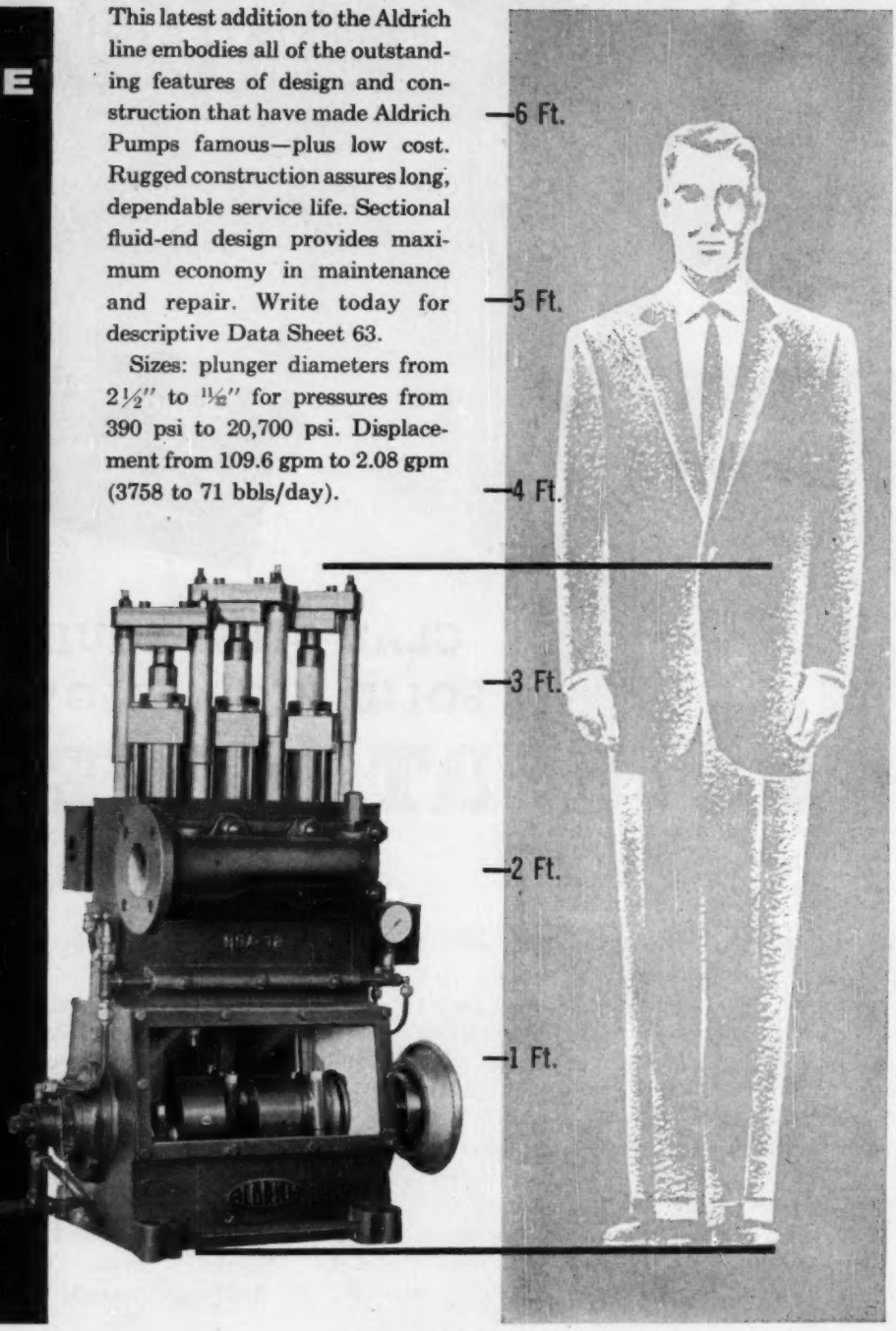
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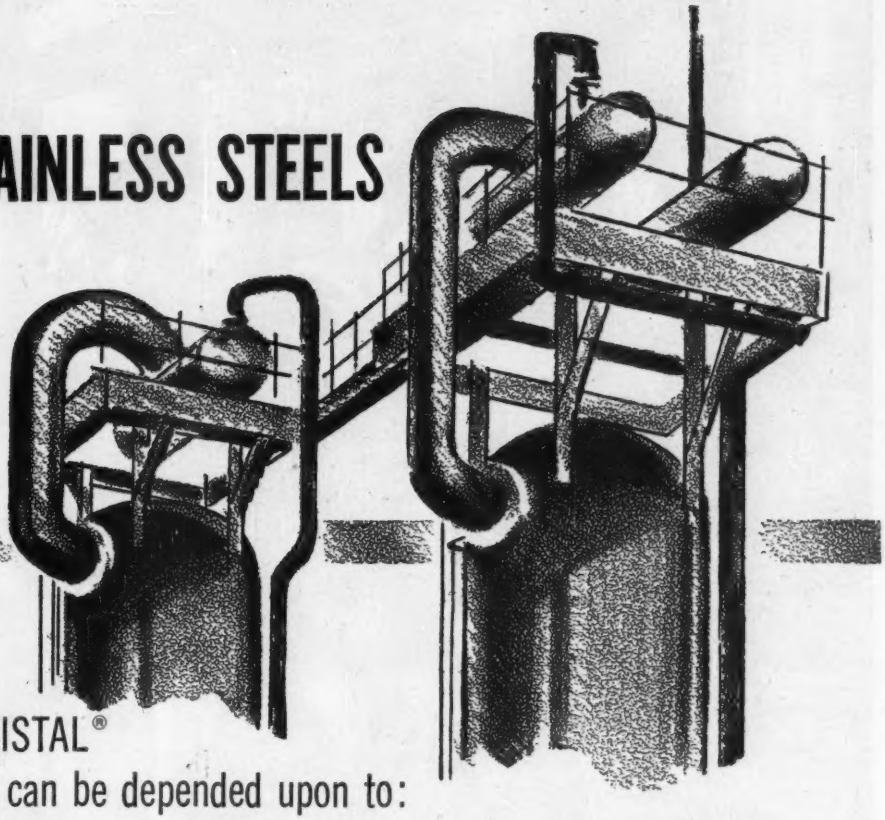
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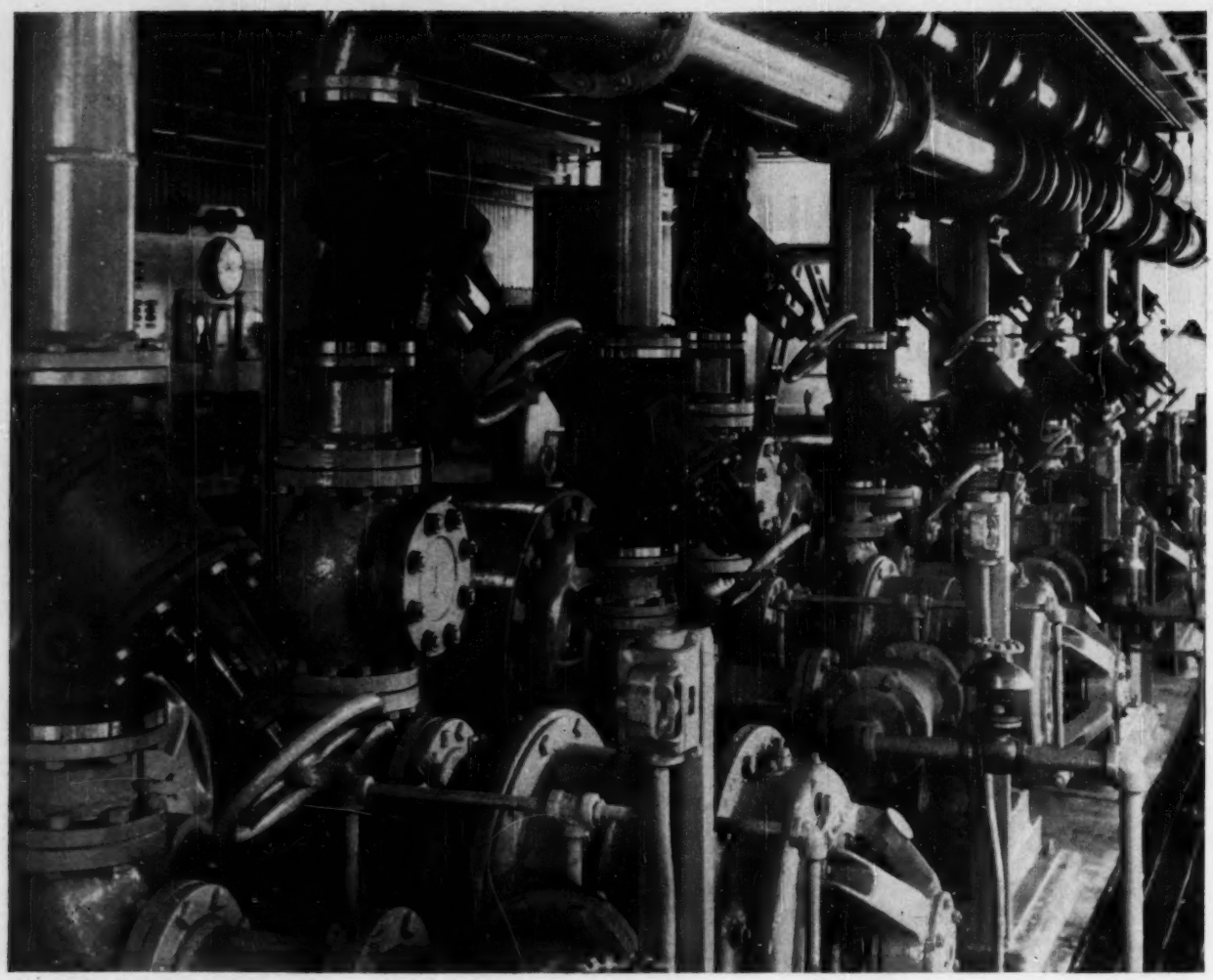
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It is right here that pitting from chloride attack causes other structural metals to fall down. This is why titanium should be specified for valve trim, drums, rollers, presses, heat exchangers and other equipment exposed to unusually corrosive conditions like these.

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REM-CRU's expanded facilities mean *fast* delivery of titanium—in the form you want it.

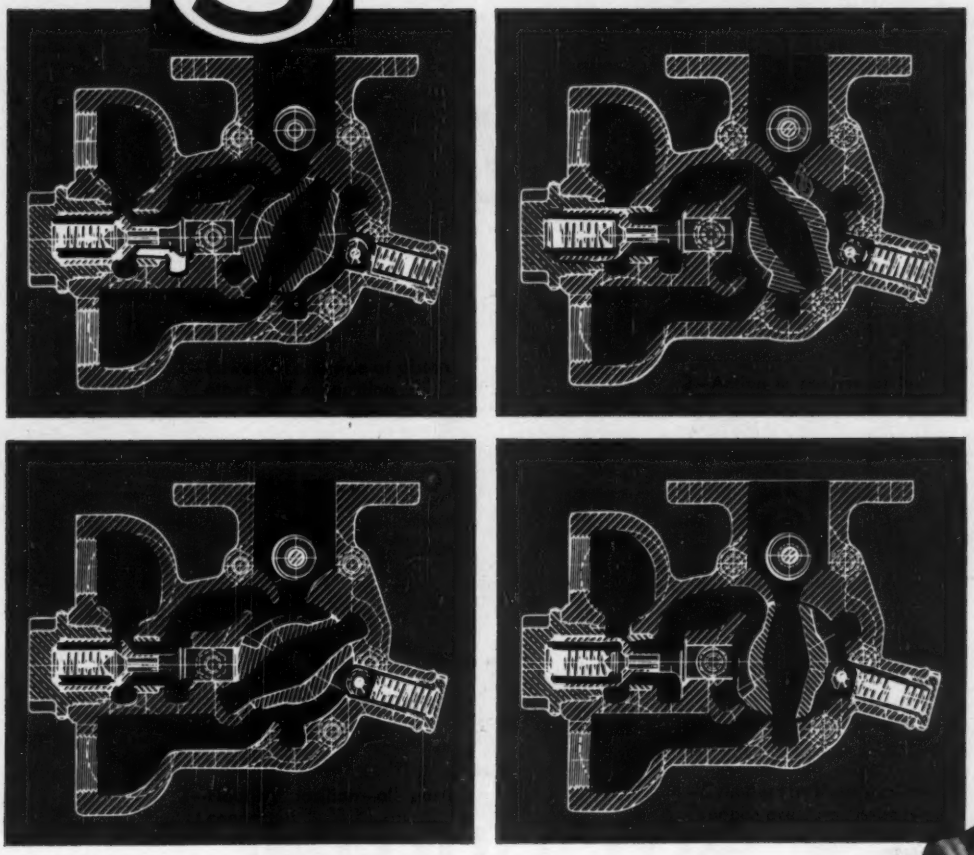
REM-CRU TITANIUM

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TYPE 555-RO

Four-Way Hydraulic Operating Valve

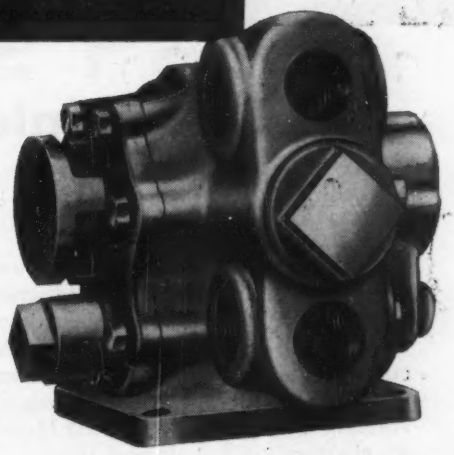


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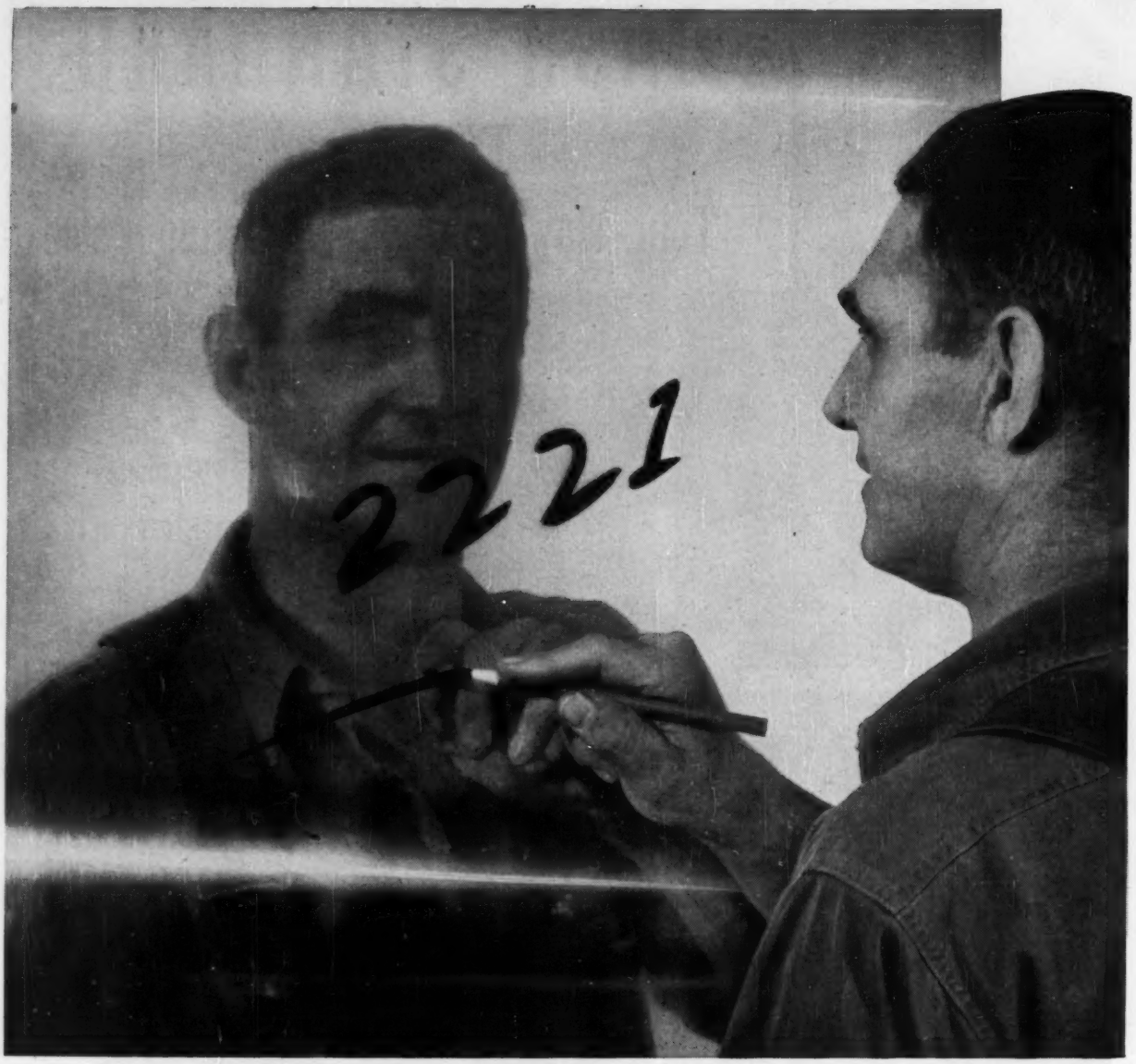


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Chemical Engineering
MARCH 1955

Do You Know the Answers?



- ☐ What factor accelerates trends toward automation and continuous processes?
- ☐ What development is stimulating real advances in construction materials?
- ☐ Why are chemical engineers being drawn into more and more diverse fields?
- ☐ What are some of the newest tools for cutting cost and solving problems?
- ☐ What new area of technology is the engineer's most challenging frontier?
- ☐ Why must you know of the progress of your brethren in the profession?

And Why Technology Is...

Setting the Pace

1955 WILL be another year marked, and molded, by engineering advances and changing technology throughout the chemical process industries.

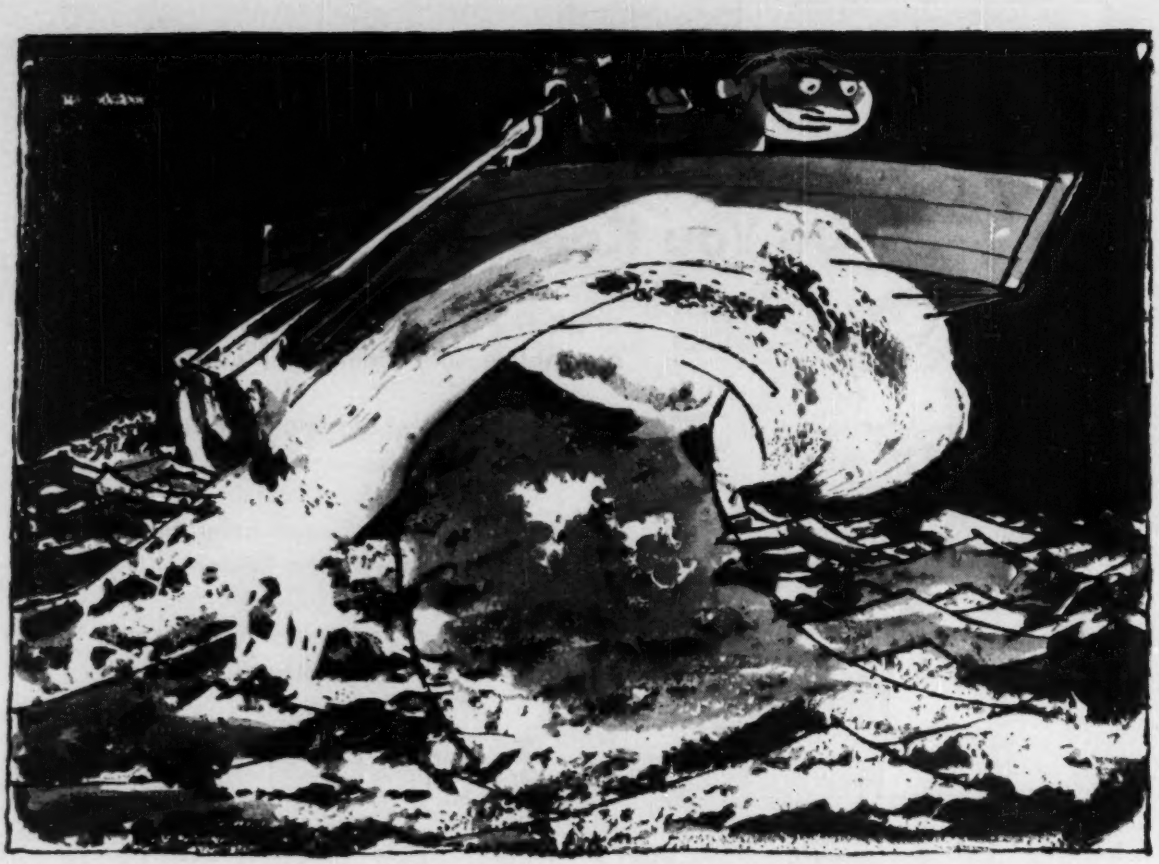
For today it's technology that sets the pace. Not Wall Street, nor tariffs, nor Washington, nor the salesmen nor the economists—not these so much as changing technology alone.

The reason is simple: Nothing can match technology's inexorable speed and merciless efficiency in replacing, often killing, entire processes, products, markets, industries, even economies. Nor in creating them!

That's why chemical management as well as chemical engineers in development, design and production-processing responsibilities now accept this accelerating technological turnover as a prime factor to be reckoned with. Wise management, alert to the challenge, is budgeting more time and effort to the study of long-range technical trends and economics. This, in turn, creates broader horizons as well as new responsibilities.

With this in mind, we present here our 32nd annual review-and-forecast report. This year, as is fitting, we take a close look at technology as today's great pace-setter.

John R. Callaham



No Letup in Technical Progress

Find it difficult to keep up with engineering developments? Here's a review of last year's most significant advances.

Last year was a busy one for most chemical engineers. Despite the lessened pressures of military mobilization and materials shortages during 1954, the year saw many notable new engineering developments and the reinforcement of certain technological trends.

Driving forces behind the chemical engineer's activity were varied:

- Economic pressure of keener competition was responsible for the acceleration of trends toward more automatic control, continuous processes and mechanized materials handling.
- Coming out of the nuclear energy field were advances in materials of construction, liquid-liquid extraction, ion exchange and sealless pumps.
- Pressures of legislation and public opinion were stimulating the development of improved or cheaper methods for pollution control.
- Broadening horizons of the profession were drawing the chemical engineer to a greater degree into such diverse fields as plant maintenance, statistics, nuclear power and combustion kinetics.

Summarized in these eight pages are the recent developments and current trends which, in the opinion of the editors, warrant review and interpretation for those of you who want to keep up with the accomplishments of the chemical engineering profession.

Automation: From Fancy to Fact

Data processing, digital recording point the way to the fully automatic, computer-guided plant.

In the diary of the chemical engineer the last couple of years is recorded as the time when management "discovered" automation.

The idea of automatic control, of course, is not new to the chemical engineer. Most of the automation hullaballoo today is coming from the mechanical indus-

tries, where automatic control in the past has been very elementary indeed. There the ideas of coordinated automatic materials handling and automatically controlled machining operations have suddenly assumed dramatic proportions.

Several important new trends are beginning to make themselves felt. One travels under the rather inclusive name of "data processing." When your panelboard grows beyond a certain size, what do you do with the space-consuming recorders, and how do you use the hundreds of graphic charts you accumulate in even a week's time?

Most solutions to this problem revolve around the idea of automatic scanning of the process variables. While any point is out of control it can be automatically recorded, either graphically, or digitally by electric printer via a digital converter.

A byproduct of the new trend toward digital, rather than graphic, data logging is that information can easily be telemetered over long distances. If desired, it can be recorded, not only on a printed record, but also on punch cards for later analysis by high-speed computers. Eventually, data so recorded will tie in directly with automatic computer control.

Another trend that is already well established is the use of dynamic analysis techniques—frequency response—in studying the performance of both instruments and process components. Frequency response analysis offers a convenient way of analyzing instruments and process together to get optimum process design.

In the last few years there has been a good deal of talk about the idea of computer control as a substitute for manual adjustment of control instrument settings. There are tremendous hurdles in this approach to the fully automatic plant, but even now the first beginnings are being made. Development will be slow, because the chemical engineer seldom knows the process thoroughly enough to give the computer adequate instructions. Nevertheless, in at least one or two experimental installations the problem is being tackled.

Key to Better Materials Handling

Coordination of the whole team—from designers to accountants—can reduce handling costs.

Another field beginning to yield to the engineer's systematic attack is that of materials handling. Emphasis is now on an organized, coordinated approach to materials handling to reduce plant operating costs.

What's wrong with conventional procedures? For one thing, accounting records usually do not reflect the true cost of materials handling.

Other faults include the failure to give materials handling the necessary early attention in the planning of a new plant. This often results in ill-considered extremes. One is an elaborate maze of automatically controlled conveyors, elevators and storage hoppers that may not be economical unless volume is high and continuous. At the other extreme is investment in a few low-cost items such as hand trucks—that look like they might do the job—but often mean congestion and top-heavy labor costs.

So engineers and management are changing accounting procedures to isolate handling costs. They are bringing into the picture other plant functions concerned with materials handling, such as methods, production control, safety, purchasing, traffic and labor relations—and coordinating the whole effort with engineering specialists.

These materials handling specialists are high enough up on the organizational ladder to command the respect of other department heads. They win cooperation by doing a good job of streamlining handling operations and by selling their services rather than ordering changes.

Maintenance Engineer Gains in Stature

Chemical industry is applying more technical talent to solving costly maintenance problems.

Still another field in which the chemical engineer is playing an increasingly important role is maintenance. Chemical plant maintenance departments are becoming increasingly populated with graduate engineers. Even today's foreman may have a B.S. degree.

Technical staff assistance to maintenance line supervision is another evidence of this trend. Operating supervision has had the help of technical study groups for a long time. It's becoming just as important, owing to today's high costs and the greater complexity of maintenance work, for other technical groups to give full time to maintenance problems.

Equipment history cards, along with other controls, are coming into more general use. History cards show how maintenance money is spent, deficiencies of equipment and whether the problem is one of labor, methods or materials of construction.

Use of cost charts and statistics by maintenance departments is also on the increase. Records showing total maintenance expense, investment, percent of investment, total production and units of production per maintenance dollar—if charted over the years—can do much to help a plant get full value from its capital and maintenance dollars.

New Combinations of Old Materials

Coatings, linings, plating feature advances in construction materials for chemical equipment.

Contributing to reduced maintenance cost, as well as making possible improved equipment designs, are recent developments in materials of construction. Last

What does the nuclear reactor development program mean to the chemical engineer? ⟶

Nuclear progress foreshadows power at competitive costs, gamma rays for catalyzing reactions.

year saw the ingenious altering and combining of established materials to produce new and useful forms.

Take polyethylene, for example; an irradiated form of this plastic, with greatly improved temperature resistance, has been made commercially available. Another modification of an older material is a resinless impervious graphite; it's made impervious by filling its pores with carbon. Result is greatly improved resistance to heat and corrosive attack.

Sheathed Ferrolum is another new, unconventional material. It consists of lead-lined steel with sheathing of carbon or graphite–permitting use with erosive, abrasive or turbulent liquids.

A substantial contribution to the upgrading of low-alloy steels for improved heat and corrosion resistance seems to be in the making with a new aluminum coating process. Crux of the process is a patented salt-bath treatment which makes it possible to coat intricate shapes evenly.

New low-density ceramic coatings developed at Armour Research Foundation are applied from chemical solutions. They are not as brittle as porcelain enamel and do not contain bonding agents. They are highly resistant to heat and especially useful for services involving molten metals or viscous liquids, but do not prevent chemical attack by vapors or liquids of low surface tension and viscosity.

Glassed outside as well as inside are new utility tanks designed to meet the need for inexpensive storage tanks for neutral products like paint, pigments, wax, antifreeze, liquid sugar, ink–products which could be stored in plain steel were it not for product contamination. Outside is easily cleaned and never requires painting.

Chemical nickel plating–deposition from a solution by chemical reduction rather than by electrolytic action –has reached sizable proportions for lining of piping and equipment used in AEC work. The process is now being applied to commercial chemical equipment.

Nuclear Bandwagon Is Getting Crowded

Accelerating reactor development program promises power from the atom at 6 to 7 mills per kwh.

Although many advances in materials have come out of the atomic energy program, most widespread interest right now is in the prospect of nuclear power.

During the past year the psychological atmosphere surrounding nuclear power has undergone a bigger change than at any time since V-J Day. Where a year ago it was hard to find an engineer willing to predict commercial power from the atom in less than one or two decades, today a large part of industrial America is either on, or rushing to get on, the nuclear bandwagon.

Engineers are now talking of 10%, or even 20%, of the total U. S. electric load being carried by nuclear-powered generating plants by 1975–a capacity of 20-40 million kw. They are talking in terms of investment costs by 1960 only about twice those of conventional boiler-powered plants. And power costs between 6 and 7 mills per kwh. are commonly predicted.

Diversification of power reactor designs has gone forward at an accelerated rate since the formation of the industry teams several years ago. Of the many proposed designs, AEC plans to concentrate development for the next five years on five promising ones.

From a chemical engineering standpoint one of the most interesting of the proposed reactor designs–although not included in AEC's current program–has come from Brookhaven National Laboratory.

The fuel is a molten alloy of U-233 in bismuth. The proposal involves the complete integration of reactor with chemical processing of the fuel, plus breeding via a blanket of thorium metal dissolved in molten bismuth. By continuous processing of the circulating fuel and breeder blanket, using molten salt extraction to separate fission byproducts from the former and new U-233 from the latter, the reactor would consume thorium, put out heat and fission products. Passage of the fuel and blanket streams through heat exchangers would generate steam for power.

The addition of two more producers now makes four who recover uranium compounds from Florida phosphate rock. These processes have now been revealed as dependent on solvent extraction of a uranium-bearing solution produced by leaching the plant's output of superphosphate. AEC is also interested in getting uranium from the now discarded phosphate overburden.

Radiation Unlocks New Chemical Doors

Gamma radiation and cathode rays can initiate, accelerate, improve yields of chemical processes.

To the chemical engineer radiation, rather than power, may be the principal product of nuclear reactors.

There's a growing realization in the industry of the exciting potential of radiation energy–cathode rays via electron acceleration as well as gamma rays from nuclear fission–to initiate and accelerate reactions.

Radiation promotes polymerization of monomers like styrene and ethylene; modifies the structure of materials after polymerization (e.g., polyethylene); permits reactions to proceed which would otherwise require heat and catalysts or which give uneconomical yields under radiation-free conditions.

Perhaps the most striking things about gamma radiation as a reaction promoter are its ability to pass through walls of pressure vessels and its quick, even effect on all parts of a reaction mixture.

Attracted by this potential, Standard Oil Development Co. is building a privately financed $250,000 gamma-radiation laboratory. Catalytic cracking and polymerizations will get close looks. Source of energy: An $18,000 hunk of radioactive cobalt which has been

cooking at Brookhaven National Laboratory for more than two years. Diamond Alkali Co. has just revealed its plans for a similar research program.

On a commercial basis, costs will depend largely on the source of radiation—waste products from nuclear fission, materials which have been made radioactive by exposure within a nuclear reactor, or exposing the process materials themselves within a nuclear reactor.

Actually, cathode-ray generators, the electron accelerators, may be the best commercial bet for some time. They've been under investigation ten years or more, their costs are better known. They can be turned on and off (when radiation is not needed no radiation is produced), their beams can be concentrated on specific areas, they can be installed in production lines.

And while it's true that cathode rays haven't the penetrating power of gamma rays, they will suffice for treatment of surfaces and of relatively thin materials.

High Temperature—A Challenging Frontier

Industrial chemical processes at 20,000 F. are within the realm of reason with new techniques.

Although radiation can speed up chemical reactions, it can't help where high temperatures are needed to get favorable equilibrium conditions. A notable case is the process of fixing atmospheric nitrogen by quick-chilling from temperatures around 4,000 F.

From 1939 to 1946 researchers at the University of Wisconsin explored this idea; it has since been developed further by Food Machinery and Chemical Corp. In a plant near Lawrence, Kan., FMC produced up to 40 tons per day of nitric acid for the U.S. Army.

Contracts for this demonstration unit have now been terminated, but Food Machinery engineers hope to correct certain technological difficulties and get the process on a paying basis, through further work.

Generally, processes for commercial production of chemicals have operated at temperatures below that of the carbon arc (6,300 F.). The solar furnace now being used by engineers at Consolidated Vultee Aircraft Corp. may help us extend our knowledge to 8,500 F.

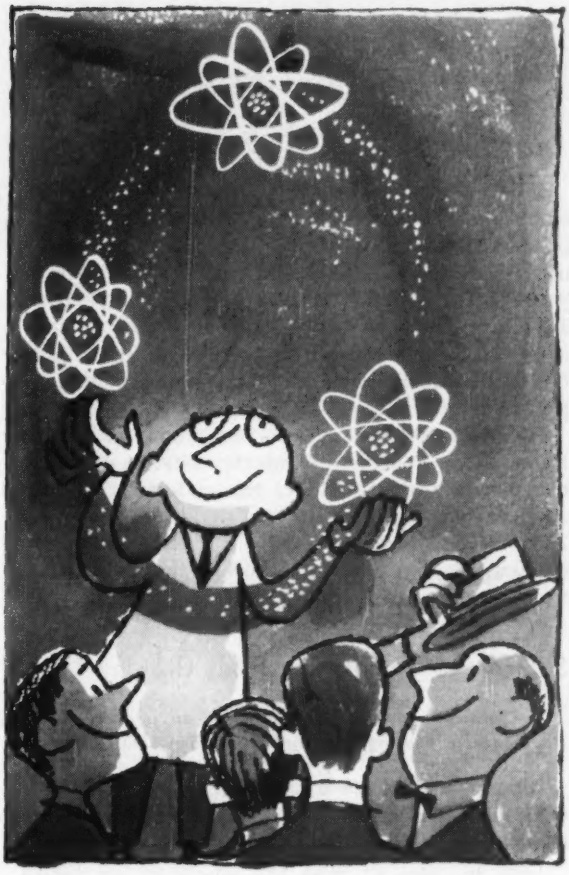
But there are those who strive towards still higher temperature by using the high-intensity electric arc. Its maximum temperature—though never precisely measured—might be as high as 20,000 F. This fierce heat, which up to now has never been put to practical use, may open up new process fields, such as making acetylene or nitric acid.

At least one company plans to exploit this new area of technology. Light Metals Refining Corp. hopes to produce beryllium chloride from beryl ore.

Help Wanted: For Better Engine Designs

Chemical engineers needed to solve key problems in combustion thermodynamics and kinetics.

In spite of such interest in high-temperature processes, most chemical engineers consider the design of



engines out of their province. But combustion is a chemical process, and chemical engineers have become key members of engine-design teams in the past several years.

Practical design of engines—whether turbo-jet, ram-jet, diesel, spark ignition or rocket—involves problems in fluid flow, chemical reaction and heat transfer. The mathematician, aeronautical engineer and mechanical engineer have been vitally concerned with the physical aspects of combustion. But last September, at the International Symposium on Combustion in Pittsburgh, they called for further chemical assistance. Said one speaker:

"Solution of combustion problems in internal combustion engines suffers from lack of fundamental knowledge, especially in chemical kinetics of combustion."

Another speaker was concerned with rocket engines. He said: "One of the most frustrating problems in the

What progress is being made in the field of chemical engineering unit operations? →

Advances in unit operations simplify process flowsheets, reduce capital and operating costs.

development of practical rocket engines is scaling models to different sizes. Every time the scale is changed, a new combustion problem must be solved. An essential part of better scaling is a better understanding of chemical reaction rates, one of the most important variables in a rocket engine. Other factors needing more attention are transport and mixing processes, including injection rates of fuels."

A further problem of grave concern to combustion technologists: Whether the meager collection of kinetic data now available for lower temperatures will be of any use when extrapolated to the high-temperature range of combustion processes. If it isn't, then methods must be developed for collecting the necessary information at these high temperatures.

Submerged Combustion Finds Growing Uses

Chemicel industry is capitalizing on unique advantages in heating, evaporation, carbonation.

More closely related to chemical manufacturing operations is another aspect of combustion—submerged combustion.

Over the past 24 years this technique has gained rather widespread use for agitating and heating steel-mill pickle liquor without dilution. But chemical engineers have been slow to take advantage of it.

Those familiar with submerged combustion know it has merit for heating or evaporating solutions where there are problems with scaling, corrosion, high viscosity, high melting or boiling points.

Probably the original chemical installation was for evaporating water of hydration from molten glauber salt at Ozark-Mahoning's West Texas salt cake plant. Now within a comparatively short time there's been activity along a number of different lines.

Right now, submerged combustion is concentrating calcium chloride solutions, wet-process phosphoric acid, rayon spin-bath liquor, fluoborate and caustic soda (from 50% to 73%). Submerged burners help produce anhydrous HCl from muriatic acid, using calcium chloride as a desiccating agent. As a producer of carbon dioxide, submerged combustion is neutralizing waste caustic, is carbonating other types of solutions.

Manufacturers of submerged-combustion burners have overcome many design and operating difficulties to develop a reliable operation. High resistance to corrosion, together with sufficient mechanical strength, had to be built into the burners. Design and control of the burners have been developed to the point where there is no danger of explosion; units can be run at as low as 50% of capacity. For chemical industry jobs burners have heat outputs to 26 million Btu. per hr.

Drying Now in the Family Circle

No longer just an afterthought, drying gets due consideration as an integral process component.

Drying, long considered by many as a stepchild among the unit operations, is also getting more attention from chemical engineers. Closer specifications for finished products—heat sensitivity, sterility, purity—and fuel economy require the chemical processor to devote more care and finesse to this finishing step.

Efforts, too, to incorporate drying physically into continuous processes are doing much to remove drying from its anticlimactic role.

A recent innovation is the use of superheated steam rather than hot air as a heat-transfer medium and vapor carrier in continuous drying. This system gives better thermal efficiency, since the hot air normally used as a heating agent and carrier is usually discharged hot to the stack, representing an energy loss. Evaporation rates are also higher for the same operating temperature, because there is no air film within the dryer offering resistance to mass transfer.

Another trend in drying is one toward obtaining high rates of heat transfer with high-temperature heat sources —a technique tailored to continuous web or conveyor-belt processing. Heat transfer is by radiation from incandescent, gas-fired radiant burners.

In searching for better continuous drying methods some processors of heat-sensitive materials are switching from batchwise vacuum operation to use of low-temperature, low-humidity air (with dewpoints on the order of −20 F.) to save in over-all handling time.

On the chemical engineer's want list: Equipment for drying solids wet with solvents, equipment which will do three things—recover all solvent, operate in an explosion-proof manner, make use of inert gases rather than air for direct heating or provide indirect heating.

Continuous Ion Exchange Process Near

Successful continuous ion exchange would open new vistas to this newest of unit operations.

After a rather slow start, ion exchange is now being accepted as a full-fledged unit operation by chemical engineers.

Latest developments lie chiefly in three fields—continuous ion exchange, ion exclusion and electrodialysis via ion-exchange membranes.

Although chemical engineers have talked about continuous ion exchange for a long time, they have faced extraordinary difficulties in realizing their goal. Even now, only one commercial unit is actually on the market, for the limited purpose of water softening.

Researchers in this field have tried many experimental continuous designs. Some of these show real promise for eventual adaptation to practical commercial use.

Successful continuous ion exchange should overcome many of the disadvantages of the fixed bed processes now used, thus adding greatly to its application poten-

tial. Continuous ion exchangers will separate the contacting and regeneration zones and so lend themselves to better design for the specific functions of each zone. They will use less resin, less wash water and make more efficient use of the regenerant chemicals. Equipment will be smaller and more compact, subject to easier control than present methods.

Ion exclusion is properly not ion exchange in the usual sense, but it does use ion-exchange resins and depends on the differences between ionic and nonionic materials. Dow Chemical Co. engineers developed this process as an alternate to ion exchange in certain applications. Like ion exchange, ion exclusion uses fixed beds and cyclic operation, but it can, quite possibly, be made continuous, similar to ion exchange.

Membrane ion exchange, or electrodialysis, has perhaps the most uncertain future of any of these new techniques. If it proves economical, it could eventually become the most important of the lot, especially in large-scale applications and where the solutions to be treated are more concentrated than would be suitable for conventional ion exchange. Recovery of potable water from brackish and sea waters via electrodialysis could be of tremendous importance in the future. Chemical engineers might use it to recover waste pickle liquor and make salt-free caustic.

Adsorption Is Getting More Selective

New adsorbents, improved techniques enhance the standing of this separation method.

Adsorption, too, moved significantly closer in 1954 to equal stature with distillation and crystallization as a generally used separation technique. Within the short space of one month two new developments were unveiled—Linde Air Products' "molecular sieves" and Standard Oil Development's "fluid char adsorption." They represent new tools for the chemical engineer who wants to separate components of a mixture.

Fluid char adsorption uses a fluidized bed of activated carbon in conventional bubble-plate equipment to pick paraffins from refinery residue gas, recover low concentrations of acetylene from combustion or cracking processes, purify hydrogen from hydroformer gas. It brings to adsorption continuous, countercurrent operation and the high capacity inherent in any fluidized-solids system.

A necessary adjunct to any successful fluidized adsorption operation is a tough, attrition-resistant adsorbent. SOD engineers helped derive just such a carbon from a petroleum source, claim it's as rugged as coconut-shell chars, yet much cheaper.

Molecular sieves are dehydrated crystalline zeolites with uniformly sized pores of molecular dimensions. They can separate components of a liquid or gaseous mixture on a totally new basis—difference in molecular size—without regard for close boiling points, close solubilities or low relative volatilities. For instance, they can separate straight-chain compounds from branched-chain, from cyclics or from aromatics. They're said to work at higher temperatures and with lower concentrations than other materials.

Use of powdered activated carbon is continuously expanding beyond traditional color and odor removal —to remove foam-producing impurities in trona production and from ammoniacal copper solutions used in butadiene purification; to adsorb impurities causing haze or turbidity in carbonated beverages and beer.

For fixed-bed gas adsorbent carbon, a method for rapid, inexpensive reactivation-in-place without use of superheated steam has been claimed recently. Carbon, after saturation with adsorbate, is impregnated with a small amount of moderately active catalyst (e.g., chromium oxide), then warmed in an air stream until the adsorbate is completely burned away. The catalyst does not impair adsorption efficiency but makes regeneration possible at moderate temperatures.

Contacting Devices Present Confused View

Critical appraisal is needed to evaluate new contacting equipment for mass-transfer operations.

In spite of notable progress in the science of mass transfer, chemical engineers who must translate distillation, absorption and extraction theory into hardware face with dismay an increasing number of devices claimed to distill, absorb or extract things more efficiently or economically than a competitive device.

In tower trays, for example, there are the Turbogrid, Flexitray, Benturi, Uniflux, float-valve and Kittel designs now competing for the favor heretofore enjoyed almost exclusively by the bubble-cap tray and the recently rejuvenated sieve tray. In packings, the well established Raschig ring and Berl saddle are threatened by the Intalox saddle, Panapak, Tellerette and others.

Adding to this confused picture is the wider use of mechanical energy to promote more effective contacting of one phase with another. Most noteworthy development here is the pulse column, a new idea being applied to liquid-liquid extraction operations to a limited extent by industry, to a presumably much larger extent by the Atomic Energy Commission. Pulsations transmitted to the liquids within the column by a piston or diaphragm promote greater turbulence; reported extraction efficiencies are much greater than without pulsing.

Although application of centrifugal force in liquid-liquid extractions is now old hat, a new model Podbielniak centrifugal extractor made news at the recent AIChE meeting in New York. Parke, Davis Co. reported substantial savings in the extraction of unfiltered Chloromycetin broth, compared with its former two-step filtration-extraction procedure.

Application of the centrifugal contactor idea to gas

What's new in process equipment and engineering tools for solving those tough problems? ➡

Liquid cyclones and canned-rotor pumps, scale models and computers show new gains in process field.

absorption featured a symposium on gas absorption held by the Institution of Chemical Engineers (London) at the University of Birmingham last April. Three papers of this group dealt with devices similar to the rotating still originally developed by Piazza in Argentina some years ago. It's too early yet to assess the extent to which centrifugal contactors may find use in absorption and distillation, although chemical engineers may take a dim view of anything which offsets reduced capital costs with higher maintenance expense.

Flocculants Aid Solid-Liquid Separations

New filters, better insight into liquid cyclone operation are other advances in this field.

In the field of solid-liquid separations, new flocculants lead the pack of developments. Following on the heels of a greatly expanded range of filter fabrics brought out since the war, these new products really broaden the operating area of successful filtration.

Already a number of ore-dressing engineers are using these flocculating agents to speed their settling and filtering operations. In many cases these materials are making it feasible to carry out separations that were previously uneconomic.

Some suppliers of the new flocculants will not talk about the chemical nature of their materials until the patent situation is resolved. However, at least two products are identified as processed natural guar gums that reportedly work in dosages as small as 0.005%.

Liquid cyclones, which have recently surged to prominence, now are made in a wider range of sizes to classify solids from 5 to 100 microns. Design changes have overcome a tendency to erode badly. Operating variables and their relationship to design are now fairly well enough understood; engineers can design installations to get predictable results.

The new flat-bed moving-tray filters of the Bird-Prayon, Eimco and Giorgini (Dorr-Oliver) types demonstrated their prowess last year in phosphoric acid plants. They are especially effective for countercurrent washing without cutback or dilution of the filtrate.

A major design change in plate-and-frame construction was unveiled in the Eimco-Burwell filter. With frames mounted in diametrically opposed pairs on a common shaft, a clear one can be rotated into the press as a full one is removed.

Trends to watch: Vacuum filters now being operated at higher speeds for higher output; shift toward use of fully plastic-protected steel for filter construction in preference to stainless steel; integration of separating units to give a better over-all job or one that couldn't be done at all previously.

Pumps and Piping Make New Advances

Canned-rotor pumps, plastic piping dominate the list of developments in liquid handling.

Whether in movement or storage, handling of liquids is an ever-present problem in the process industries.

After grappling for many years with shaft-sealing troubles on rotary pumps, chemical engineers now are finding one answer in the canned-rotor pump. First introduced about three years ago, this pump has all rotating elements, including the motor rotor, sealed within a pressure-tight housing. Its applications in pumping chemicals are growing rapidly.

Another new pump of Swedish design employs a hydrodynamically balanced liquid-ring seal to eliminate close running clearances and resultant wear.

A new solids-handling pump with a recessed impeller and chamber-type casing is pumping a range of materials from whole fruit (cherries) to cement slurries and raw sewage without choking or degradation of the solids.

Engineers in the petroleum industry are making news with plastic piping. In the Williston Basin oil field nearly 10 miles of 3-in. cellulose acetate-butyrate pipeline is transferring crude oil from well to loading point. At Heidelberg, Miss., a 12-mile network of 2 and 6-in. pipe (resin-rubber blend) was recently laid to carry salt water from oil wells to the disposal point. High-pressure steel pipelines with field-installed, thin-wall plastic liners are now undergoing field tests in the continuing fight against corrosion.

For in-plant use unplasticized polyvinyl chloride pipe with standard IPS Schedule 40 and 80 dimensions is undergoing plant trials with evidence, shown by increased demand, that it's catching on. A shortage of suitable fittings can be expected to dwindle as recently introduced injection-molded, unplasticized PVC fittings overcome a handicap that has hampered acceptance of PVC piping systems.

Other significant trends: Greater use of vapor-conserving storage tanks for volatile liquids; increasing use of inland waterways for transporting chemical products; use of laminated plastic tank trucks for road haulage of chemicals. Big news in chemical shipping circles last year was the inauguration of deepwater bulk liquid chemical shipping in a specially built 5-million-gal. chemical tanker.

Brisk Trade in Pollution-Control Schemes

Oxidation processes, both biological and chemical, share the industrial waste disposal spotlight.

The chemical engineer's biggest headache in dealing with fluids is not, however, as simple as transport and storage; it's the safe and adequate disposal of wastes.

There now seems to be a better understanding between regulatory people and men from industry, greater tendency to base both legislative and technical measures for pollution control on fact rather than guesswork. Industry's engineers realize they must learn much more about the measurement and mechanism of pollution if

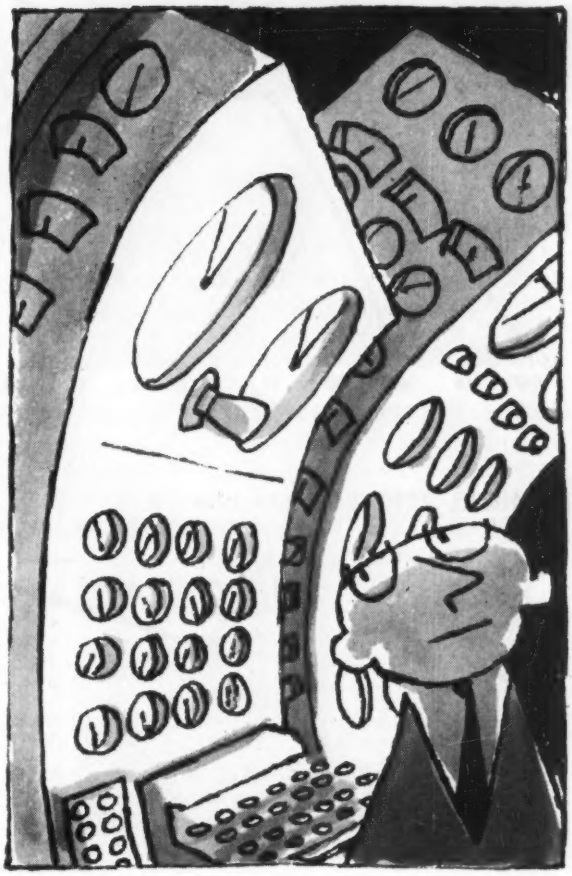
they are to deal with problems quickly and effectively. And legislators are beginning to agree that pollution control does not–and cannot–entail complete elimination of wastes; it can be expected only to dispose of wastes in such a way as to avoid air and stream contamination harmful to the public.

But while fundamental research goes on, the chemical engineer must handle with available technology current problems as they come along. A strong trend in that technology is the increasing use of biological oxidation of liquid organic wastes–based on the ability of bacterial cultures to break down organic compounds by oxidation. Phenol, formaldehyde, acetic acid are some of the chemicals being well handled by this technique.

Many waste gases, and liquids which can be vaporized cheaply, are disposed of now by catalytic oxidation. High degrees of cleanup are obtained with tail gases from phthalic anhydride manufacture and catalytic cracking of petroleum, solvent vapors in metal-decorating industry and fumes from varnish cooking.

Still in the proving stage is the Zimmermann wet-combustion process, which oxidizes organic wastes with air under pressure high enough to maintain liquid conditions. Sulfite pulp waste liquor is getting this treatment with good results so far. Actually the Zimmermann technique has a very wide potential, provided the cost of high-pressure equipment–800 psi. and more–can be justified.

One of the most widespread and persistent air-pollution control problems facing the chemical engineer is economic removal of SO_2 and SO_3 from smelter, acid plant and refinery gases. The Cominco process–utilizing a two-stage, ammonium sulfite-bisulfite scrubber setup–looks like one of the better solutions.



New Tools Command Engineer's Attention

Tricks of the trade cut engineering costs, stretch manpower, solve toughest operating problems.

The chemical engineer who doesn't design his new plant with three-dimensional models, calculate optimum operating conditions with high-speed computers or control product quality with statistics is practically as out-of-date as yesterday's newspaper.

The scale-model trend has become almost irresistible. Most recent idea to come to light is a combination of photography and scale models. Introduced by Parco Co., the technique involves taking photographs of the finished model and placing dimensions, along with other engineering data, on the print, thereby eliminating the conventional tracing and blueprint.

Growing use of electronic "brains" to solve engineering problems is putting a premium on human brains–the only kind that can issue proper instructions to the computers. For example, Socony-Vacuum, in order to get the most mileage from its new computer at Paulsboro, had to put its engineers to work reducing the operations at its complex refinery to 100 equations–a mathematical model, as it were. These equations, punched into cards, are fed to the machine for storing in its "memory" until called for in a specific problem.

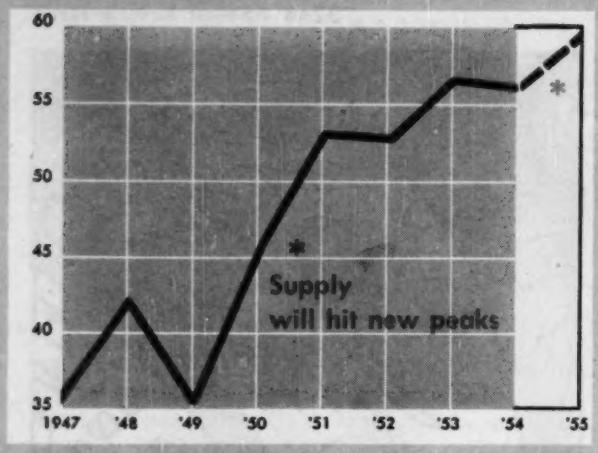
Statistics is one field of science which the chemical engineer has, until recently, neglected. The current interest in this subject is evidenced by his interest in the numerous books, articles, technical meetings and university courses dealing with various aspects of statistics, such as quality control, sampling methods, design of experiments and correlation of data.

Still pretty much an enigma to most chemical engineers is the problem-solving technique known as operations research, a coordination of mathematics, statistics, engineering, economics and psychology. Although the chemical industry isn't exactly rushing out to hire operations research men, there's an undercurrent of interest which may erupt into a full-blown trend.

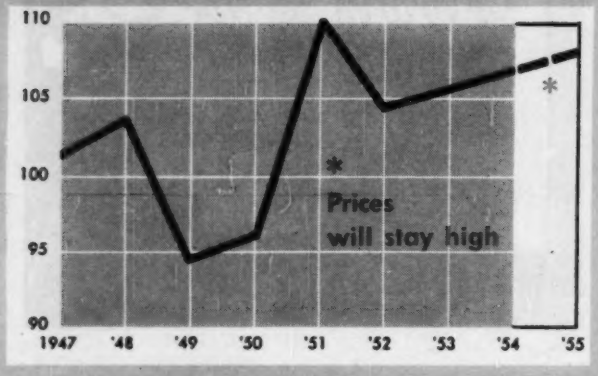
Like we said before, the chemical engineer was a busy man last year. And from what we've seen and heard so far, he'll bring forth just as many new and exciting developments in 1955.

What is the business outlook for the chemical process industries this year? →

CHEMICAL OUTPUT (Billion Dollars)

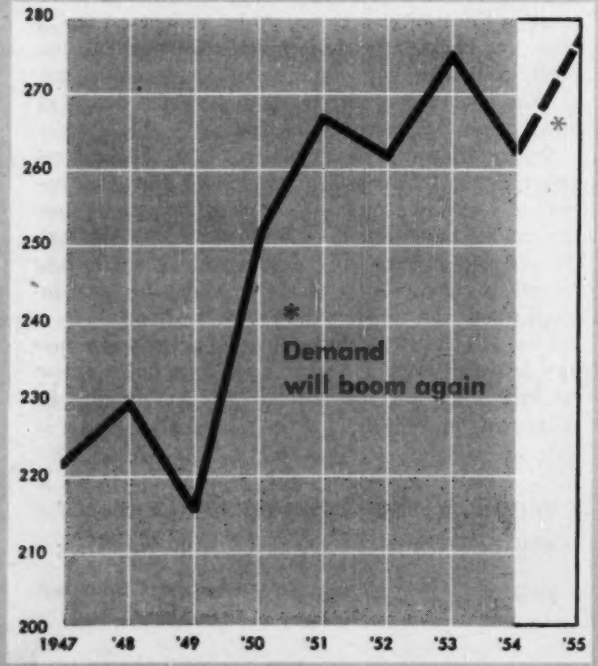


CHEMICAL PRICES (1947—1949=100)



Source: Bureau of Labor Statistics

CHEMICAL CONSUMPTION (1935=100)



After a Slump,

THE BUSINESS recession that began two summers ago kept most chemical process industries from holding to their usual growth rate during the greater part of last year. But the recovery that took hold in the final months of 1954 promises to make the interruption a brief one.

Value of output in the chemical process industries totaled about $56 billion in 1954, off slightly from the 1953 record figure. Production this year should reach $59.5 billion, a new record.

Demand for chemicals dipped considerably more than output last year, largely as a result of inventory cutting by industries using large volumes of chemicals. The chemical consumption index (below) dropped from 275 in 1953 (1935 = 100) to 265 in 1954. But prospects are brighter this year and the index should bounce back to about 278.

Prices, unlike supply and demand, did show a slight rise last year. The Bureau of Labor Statistics' chemical price index rose from 105.7 for 1953 (1947-1949 = 100) to 107.0 last year. And prices most likely will keep rising in 1955—to an index of just over 108.

Nearly All Have a Bright Future

The general business outlook for 1955, as seen by McGraw-Hill's Economics Dept., is moderate recovery over 1954 levels, and in most respects, very close to the boom levels of 1953. Last fall's business pickup looks plenty strong enough to carry well into 1955.

Gross National Product—value of all goods and services produced—will be about $365 billion in 1955, a rise of $8 billion over last year, though still not up to the peak rate of $370 billion reached during the second quarter of 1953.

Industrial production, as measured by the Federal Reserve Board Index, is expected to average about 130 for the year 1955 (1947-1949 = 100). Between summer of 1953 and March 1954 this index dropped 10%—from 137 to 123. The average for all of 1954 was only 125, despite the year-end business recovery.

CE's Chemical Consumption Index(1935 = 100).

	1953	1954	1954 vs. 1953
TOTAL	274.64	264.59	−3.7%
Fertilizers	58.92	58.47	− 0.8
Pulp and paper	30.31	30.81	+ 1.6
Glass	23.34	23.37	+ 0.1
Petroleum	27.71	27.44	− 1.0
Paints and varnish	28.08	27.35	− 2.6
Iron and steel	17.06	13.92	−18.4
Rayon	28.55	26.16	− 8.4
Textiles	10.62	9.87	− 7.1
Coal products	11.93	10.27	−13.9
Leather	4.23	3.99	− 5.7
Industrial explosives	9.02	8.20	− 9.1
Rubber	6.33	5.76	− 9.0
Plastics	18.54	18.98	+ 2.4

Supply and Demand Head for Boom

Nonmanufacturing industries should do a little better. Construction, for example, will show a 7% rise in dollar value put in place, according to the Departments of Commerce and Labor. Consumer spending on services and nondurable goods will set new records, though spending on durables probably won't change much from last year's level.

Chemical Users Call the Play

Being essentially a producer of intermediate products, the chemical industry proper is keyed closely to production of other industries. So let's take a look at how activity shapes up for some of these chemical customers this year:

Pulp and paper, generally steady in 1954, looks forward to continued high demand. Total production is expected to reach an all-time high—over 27 million tons. Economic utilization of raw materials is being resolved by a gradual swing to hardwoods wherever location permits. The biggest sales increase in the industry will be in paperboard, which experienced a definite upswing toward the end of last year. Newsprint production in the U. S. rose nearly 10% in 1954, indicating that imports may soon tend to level off. Most optimistic outlook has been voiced by Roy K. Ferguson, president of St. Regis Paper, who predicts a 10-12% boost in over-all paper sales this year.

In rubber, replacement tires are the biggest factor; demand should go up 4%. And with at least as many cars and trucks slated for production in 1955 as in 1954, there shouldn't be any drop-off in original tire sales. Movement of rubber companies into the chemical business should also help boost their total sales.

Textiles, after a really severe slump, appear to be heading into one of their better years—which, in turn, should benefit the skidding dyestuffs industry. Textile output in 1954 was considerably below the 1947-1949 average. But it ought to be up about 6% in 1955, with most of the increase coming in cotton and synthetics. Production of woolen goods, though, is expected to fall still further. (See also p. 256.)

Production of most nonferrous metals should be up in 1955. Last year aluminum output hit an all-time high, though production records of copper, lead and especially zinc weren't so sensational, and magnesium output was way down. But higher industrial activity generally should help. There's a peculiar situation in titanium: The long-range demand picture is extremely happy, but now there's a temporary oversupply and prices were cut twice last year.

Companies making glass, clay and stone products are headed for another boom year because of heavy demand from the construction industry. Substantial increases are expected in homebuilding, commercial, institutional and highway construction. Only industrial building, among the majors, is expected to drop.

Estimated demand for petroleum products (domestic and exports) indicates about a 4% jump over 1954, which is considerably better than last year's rise. Higher industrial output will mean greater demand for industrial fuels. More truck tonnage will mean more motor fuel. And large numbers of housing unit completions will mean additional demand for home heating fuels. Exports will be the only big sufferers—down 16-20%.

Agriculture is one of the few important segments of the economy that's likely to experience a worse year in 1955 than in 1954. Total farm income is expected to drop more than the average of prices that farmers pay. But lower farmer purchasing power will probably hit farm equipment makers harder than producers of agricultural chemicals. The very fact that prices are low will increase the farmers' interest in using fertilizers and pesticides to produce more per acre and thus maintain his income level. Total plant nutrient output should go up 5%. Pesticide production for domestic use will probably drop only slightly below last year's 320 million lb. (excluding sulfur), with only benzene hexachloride suffering significantly.

Plastics, which better than held their own last year, are expected to hit record production and consumption rates in 1955—possibly as much as a 10% boost in sales. And most spectacular again will be polyethylene. Consumption of this newcomer last year was about 200 million lb.—up 35%; it should hit close to 300 million lb. in 1955. Nevertheless, there'll be some excess capacity for awhile, since new plants scheduled for completion this year will bring capacity to nearly 550 million lb. a year. Vinyl chloride, too, through growing fast, is in a serious over-capacity situation.

Chemicals Will Carry the Ball

To supply all these growing outlets (and many more), total chemical production is expected to rise about 5% in 1955. No serious shortages are in view. Here's how a few commodities stand:

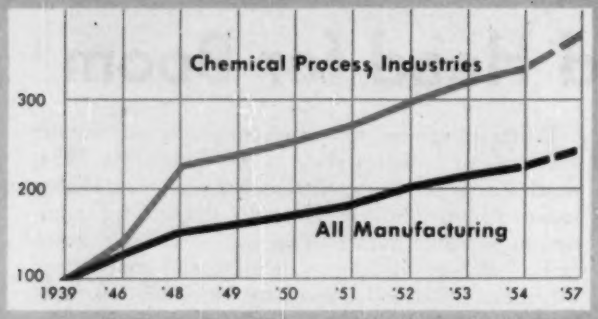
Sulfur production was up about 350,000 tons in 1954, the vast bulk of which was made by the Frasch process. Sulfuric acid experienced similar growth. Production of nitric acid rose to an estimated 1.92 million tons—up 8%—and phosphoric acid output was 2.9 million tons, a 9% rise. All these are in good supply-demand balance.

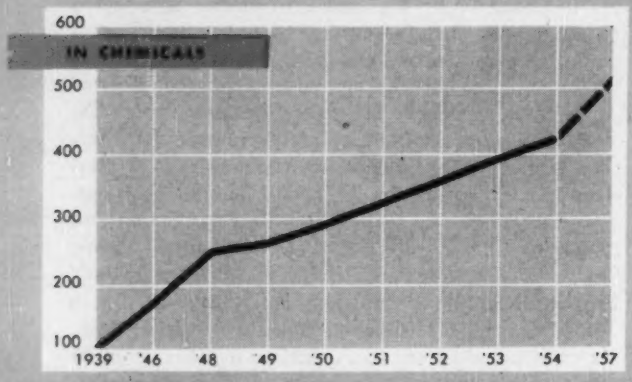
Caustic soda is still glutting the Gulf Coast, but shipments by tanker to the East Coast may help. One relief step being taken by Dow at Freeport, Tex., is to carbonate excess cell liquor (10% caustic) directly to soda ash.

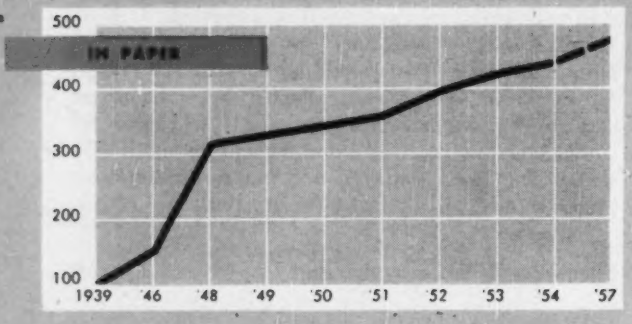
Finally, as expected, petrochemicals had another boom year and expect a still better one in 1955. Total production in 1954 (using the most common broad definition of the word) was about 27 billion lb. This should rise to about 32 billion lb. this year.

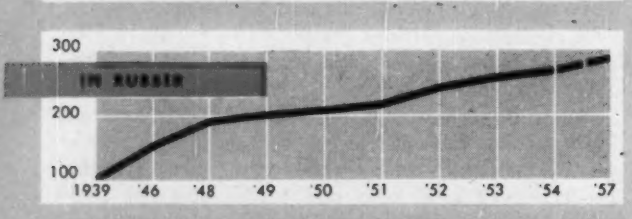
EXPANDING
CHEMICAL PROCESS INDUSTRIES

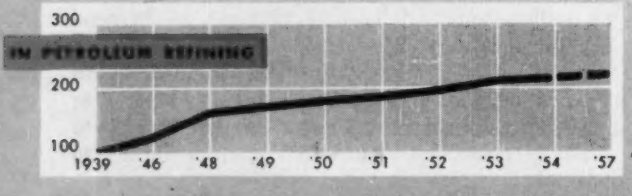
Capacity Index 1939 = 100

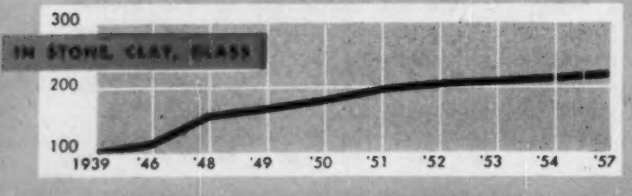












Source: McGraw-Hill Dept. of Economics

Capacity and

CHEMICAL process industries expect to keep capacity and capital spending at a high level over the next several years.

That's how it looks from recent preliminary surveys made by McGraw-Hill's Dept. of Economics.

Here is a quick summary of the results:

• Chemical process industries will invest almost as much in new plants and equipment during 1955 as in 1954. Preliminary plans indicate a drop of 2%. Total capital spending will run about $3 billion for the group made up of chemicals, paper, rubber, petroleum refining and ceramics. And advance plans indicate a higher level of spending in 1956 and '57.

• Over the 1954-1957 period, the survey shows we can expect an 11% increase in productive capacity in the chemical process industries. Capacity in 1954 was 5% greater than in 1953.

Chemicals Lead the Expansion

Chemicals, as a group, topped the process industries in percentage capacity increase for the 1953-'54 period.

	1954 Capacity Index (1939 is 100)	Increase 1953–1954
Chemicals	421	7%
Paper	437	4
Rubber	265	4
Petroleum refining	216	4
Stone, clay, glass	212	2
All manufacturing	227	4

And this also holds true for the future. The chemical process industries plan to have a capacity index of 374 by 1957—it now stands at 337. But chemicals will be the largest contributor:

	1957 Capacity Planned	Increase 1954–1957
Chemicals	514	22%
Paper	472	8
Rubber	286	8
Petroleum refining	225	4
Stone, clay, glass	218	3
All manufacturing	247	9

The defense program has stimulated much of the present expansion—which has centered itself around basic materials; particularly basic chemicals. Now this phase of our expansion program is about complete—except for ammonia.

The nitrogen expansion goal of a grand annual total of 2.93 million tons by Jan. 1, 1955 has been oversubscribed. By the middle of this year we should have a total capacity of 3.12 million tons; all but 265,000 tons of this will come from synthetic ammonia. By 1957, we will have in excess of 3.5 million tons of capacity. This data are from the Dept. of Commerce.

Phenomenal is the word for the growth of new ammonia plants since 1950. During 1950-1954, fifteen new ammonia plants were completed. This year at least four new plants will come on stream.

Spending—Reaching for New Heights

The story is quite different for sulfur and sulfuric acid. Sulfur expansion goal of 7.7 million tons will probably be reached by 1956.

For sulfuric acid, we should meet the goal total of 17.5 million tons during 1955. Currently our production capacity is enough to meet normal demands.

For other basic chemicals, the same story holds true: capacity in 1955 sufficient to meet normal demands. Chemical companies can now turn out 135 million pounds of aniline, 375 million gallons of benzene, 623.6 million pounds of phenol, 1,210 million pounds of styrene, 185 million gallons of toluene, 367.7 million pounds of phthalic anhydride.

Another large expansion in capacity has taken place in the calcium carbide and acetylene industry. At the end of 1954, this country reached an all-time high for calcium carbide capacity—1.23 million tons. This represents a 90% increase since 1950 and is enough to meet demand. Acetylene capacity is now in excess of 6,000 million cu. ft.

Without question, much of the expansion that will take place in chemicals in the next three years will not be in basic chemicals, except for ammonia. New products will be in the spotlight. Plants for nitroparaffins, urea, nitrophosphates, phenol from cumene, polyethylene, acetylene, ethylene derivatives, will all start operation in 1954-'57.

More Capacity for New Chemicals

Hercules Powder will bring a 26 million pounds per year phenol from cumene plant into production early this year, at Gibbstown, N. J. A 12 million pound dimethyl terephthalate plant will soon be completed at Burlington, N. J.

A $40 million ethylene derivatives plant will be completed in 1956 by Union Carbide at Torrance, Calif., while the Linde division will complete a $14 million silicone plant at Long Beach, W. Va.

Monsanto comes on stream with a 66 million pound polyethtylene plant in 1955. It's located at Texas City. Also in 1955, Allied Chemical will complete a 20 million pound nylon plant at Hopewell, Va.

DuPont will be active in the next several years, with a $15 million neoprene plant scheduled for completion in 1956 at Montague, Mich. And Commercial Solvents will complete a $5 million nitroparaffins plant at Sterling, La., in late 1955. For paper, petroleum refining, rubber and ceramics, the indications are that expansion will continue but at a decelerated pace.

How About Capital Spending?

The McGraw-Hill survey on capital spending shows some encouraging signs. The chemical process industries spent $3,162 million in 1953 for new plants and equipment—a high water mark. Since then there's been a gradual decline—in 1954 it was $3,011 million, and the plans are for $2,943 million in 1955. The decline, however, promises to halt in '56 and '57. Rubber and ceramics may have further declines, but the process group as a whole is expected to rise.

Preliminary 1956 investment plans look like this:

	Percent of Companies Answering		
	Up[1]	Down[1]	About Same[1]
Chemical processing	29	25	46
Chemicals	37	20	43
Paper	48	24	28
Rubber	9	55	36
Stone, clay, glass	9	22	69
All manufacturing	21	22	57

[1] Compared to 1955

Where Is the Money Coming From?

Increasing depreciation charges is one reason why there is not likely to be much in the way of outside financing by the chemical process industries for any expansion. At least for the immediate future. The industry is expected to pay for new plants out of internal funds, instead of depending on outside capital.

This planning of capital expenditures several years ahead is becoming increasingly popular, as shown by McGraw-Hill's survey. Companies were asked how far ahead they planned their capital spending.

Of the chemical companies responding 69% said they planned more than two years ahead, 42% more than three years, and 15% more than five years ahead.

In the petroleum industry, 79% said they plan more than two years ahead, 43% more than three years, and 21% more than five years ahead.

New Tax Law—New Influence

Capital spending will certainly be influenced by the liberalized depreciation provision in the new tax law. Under the new double declining method (see Chem. Eng. Dec. 1954, p. 171) a company can recover two-thirds of the investment in plants and equipment during the first half of the useful life. And under the sum-of-the-years-digits methods, three-fourths of the investment can be recovered in the first half of the useful life.

Last spring, before the new provision was adopted, the companies in the McGraw-Hill survey were asked what they would do if allowances were liberalized.

In the chemical industry, 32% indicated they would increase capital spending, 37% said they would merely rely less on outside funds, and 42% said they would use the faster recovery of cash to reduce debt.

In petroleum, 57% of the companies said they would raise investments in new plants and equipment if depreciation allowances were liberalized. None reported they would reduce outstanding debt. And the remaining 43% said they would rely less on outside funds.



From the usual melee along the Potomac, chemicals engineers can expect new and vital legislation as . . .

Washington Aims For Prosperity

CHEMICAL engineers can expect to be directly, and indirectly, affected by this year's Washington happenings.

Switching to a Democratic Congress will not have too great an effect on the general business climate—but this year's fuedin' and fussin' on Capitol Hill will likely result in new and revised legislation in which the chemical industry, and the chemical engineer, has a vital stake.

The already crowded congressional calendar holds bills on trade and tariffs, taxes (both yours and your company's) trusts, military draft and reserve, loyalty-security checks, patents, pollution control, chemical food additives and labor.

Some of these are "must" bills, almost certain to pass, others will wait a year or so. All bear on the chemical engineer and his job.

Trade Bills Start Things Boiling

Today's Washington picture differs a good deal from that of a year ago. Then, the shift from a war-actuated to a cold-peace-geared economy excited recession fears, and legislative measures to sustain prosperity were stressed. According to most seers, 1955 shapes up as one of the most prosperous years in our history. And, with domestic problems less pressing, the foreign trade jumble is again crowding into the picture.

Competition in both overseas and home markets has been stiffening as our World War II allies and enemies have regained their industrial footing. This is causing some concern in many phases of the chemical industry.

But trade is as much a political as an economic problem. And congressional chairs were hardly warm before President Eisenhower bluntly laid the international relations aspects of the problem before the lawmakers. In a special message he called for a three year trade agreements act, customs simplification, increased U.S. investments abroad, tax concessions to foreign investors and ratification of the General Agreement on Tariffs and Trade (GATT). All aim to spur trade and strengthen the free world.

Heading the calendar is the reciprocal trade agreements bill, which will give the President power to cut tariff levels by 5% each year over a three year span. Protectionists in both parties will oppose it mightily, but in the end the President will probably get just about what he asks.

The proposal to simplify customs assessments has already been opposed by the chemical industry. This measure substitutes the readily-known export value of imports for the hard-to-determine "foreign value" in calculating duties. While this has little direct effect on tariff levels, industry leaders fear that any tampering with the present system of leveling duties will make dumping easier. But the Democratic Congress is almost certain to pass this measure.

A like fate is probably in store for a bill to take a smaller tax bite from U.S. investments abroad. This will be relied on to stimulate such investment. On the other hand, a proposal to extend tax concessions to foreign investors in U.S. enterprises is likely to get lost in the congressional shuffle.

Hottest fight will come over ratification of GATT. GATT consists of a set of rules governing world trade; it concerns nearly every area of trade and tariffs. In Congress it runs headlong into the same fight that



will rage over the extension of the reciprocal trade agreements bill.

Keystone of the administration's trade program, GATT ratification has been marked a "must" bill. Whether it will pass or not, though, is a toss-up.

The administration will also liberalize present "Buy American" rules governing bidding on government contracts in favor of foreign bidders. And it may also seek a review and overhauling of '54's anti-dumping laws.

With overseas competition at a high pitch and political considerations making foreign competition rougher at home, research, engineering and production teams will be increasingly relied on to produce more and better products more economically.

Holding the Tax Line

Chemical companies have long been esteemed for plowing earnings into research and expansion programs to insure company growth. And none know better how a heavy tax load slices into earnings. All looked to 1955 for sweeping tax reforms.

They'll be disappointed.

The present Congress, the 84th, will probably extend the top rate on corporate income at the current 52%. A reduction is due to take effect in April, but, barring an unexpected drop in business before then, the present law will be extended another year.

Excise taxes on autos, gasoline, alcoholic beverages and tobacco are also due for an April paring. This will stir a fight, but until the budget's more nearly in balance the odds are that the tax line will be held.

Many other tax bills, including some on personal taxes, will be introduced, but few cuts will be voted. In '56, an election year, these will stand a better chance.

Trust Bustin' Comes Into Focus

In the past year, the administration's "new line" on antitrust actions has been more sharply defined. This year Attorney General Brownell says his department will emphasize antitrust in its legislative program.

Basis of the new program is a forthcoming report from a special committee of experts which has been poking into present laws, enforcement policies and court decisions for over a year. It is expected to propose:

- Continuing unions' exemption from anti-trust.
- Repealing present "fair trade" laws which allow manufacturers a measure of price fixing.
- Amending the Robinson-Patman Anti-Price-Discrimination Act in a number of provisions.

Some of these proposals—especially the latter two—will get a rough handling in a Democratic Congress. Whatever Brownell comes up with, a full scale congressional review of antitrust is likely.

Relatively little new developed in antitrust in 1954. But there was no slowdown in enforcement. The Republican team filed 35 new cases and closed up 54—including 12 of those cases filed in the year. Government trust busters lost some of the biggest cases ever in 1954—all were filed under the Democrats. (One of these—the much noted Du Pont-General Motors case—has been appealed to the Supreme Court.) They also won a few big ones, some by encouraging settlement before actually filing—a major point on which the "new line" is hung.

Another peg for Brownell's line is concentrating on

so-called "hard core" violations and steering clear of novel theories and doctrines.

Opportunities Ride With Nucleonics

Chemical engineers and the chemical industry will find a real challenge ahead in the development of nucleonics, both at home and abroad, under the Eisenhower "Atoms for Peace" program.

The government is allowing rapid depreciation of nuclear reactor equipment, and it has already put a price tag on reactor "fuel."

A stumbling block in industry's path is the drive by Democrats to hike the period of compulsory licensing of patents from five to ten years.

Patent Office Gets a Hand

Patents Commissioner Watson had a new arrow in his quiver when he went to Congress hunting for more money this year. A distinguished committee, headed by Dr. Vannevar Bush, encouraged more study of mechanization of patent classification and searching, patent reprinting and categorizing of patent reference and cross-reference lists.

Watson will aim for an appropriation increased by just about what newly-asked-for higher fees would bring into the coffers. With such money for the next few years, the office would be able to hire new examiners, update its classification system and shorten the average time it takes to get a patent—now nearly four years.

Tighter Check for Pollution

Chemical engineers will be directly affected by proposed new federal laws touching on industrial air and water pollution. One possibility is a law allowing 100% tax writeoffs over five years on the expense of installing abatement equipment. Chances here are that air pollution control devices, and water treatment items both will be included.

Rapid depreciation of abatement equipment doesn't enjoy much Treasury Dept. support. And it might be difficult to write an acceptable law. Other proposals include encouraging further research efforts and spurring local action.

Pesticide Tolerances Due

Food and Drug Administration leaders will affect the chemical industry this year by setting new pesticide tolerances—limits on the amounts remaining on foods.

FDA has set up the rules under which it will administer last year's pesticide amendment to the food and drug laws. FDA Commissioner Larrick feels that the showing his agency can make here will prove that a pesticide-type of regulation could easily be used in controlling introduction of food additives.

On additives, there's some chance for 1955 legislation. Odds are better, though, that this year's congressional fussin' will lead to next year's laws.

Loyalty, Security Review Coming

Government policy makers are taking a new look at the federal security program. Their conclusions will have a significant effect on a goodly number of chemical engineers.

Nowadays, either having a clearance or being able to get one is a good deal more important than ever before. For some jobs, and in some companies, it's just as important as having a degree or comparable training.

On the other side of the coin, many companies are finding it easier to hire scientists and engineers now working for federal agencies. These men are available because they feel that the chance—however remote—of future security trouble outweighs the advantages of the Civil Service System.

All feel that a revamping of the loyalty-security system is needed but they profess to hold little hope that the examiners will admit the system's shortcomings.

New Deal for Soldier-Engineers

There may be a new and better shake ahead for trained engineers taken into the armed services—with a thought to making military careers more desirable.

Pentagon officials have been considering a plan to give those with specialized training the same "breaks" given doctors. Under this plan, engineers in college ROTC programs would no longer be commissioned second lieutenants upon graduation—instead they would come in as first lieutenants and their promotions would be from special rosters. If it passes, it's hoped that military careers can be made competitive, money- and security-wise, with positions in private industry.

Meanwhile, fate of the proposed new military service program becomes difficult to predict. It's pretty sure, though, that draft calls—numberwise—will stay way down until legislators make up their minds whether to simply extend the draft, as is, or adopt some form of the President's new program (featuring UMT and a selectively recallable reserve).

Check These Developments, Too

A few other fields, ordinarily news makers, are expected to be relatively quiet—at least in Washington—in '55. Here's a rundown:

- Research—Federal spending for research and development is likely to stay around $2 billion-per-year.
- Labor—More Taft-Hartley talk—few, if any, changes. Democrats in Congress will put the National Labor Relations Board, its organization and its decisions, under scrutiny. The White House will continue with its present hands-off policy in labor disputes. Minimum wage will be raised and its coverage extended.
- Business Helps—Sharper definitions of industry classifications will be attempted by the Dept. of Commerce. First censuses of manufacturers, business and mining since 1947 are scheduled. Also, the department will begin turning out its studies of chemical production and consumption by end-use on a regular basis.

W. L. BADGER is well-known both as an author and as a consulting engineer. His contacts with the salt industry span three decades, and he has engineered evaporator and other installations around the globe. Co-author F. C. STANDIFORD works with Dr. Badger in his consulting practice. He specializes in the evaporation of electrolytic caustics and salt manufacturing. In this, the first of two articles, these authorities highlight the salt industry's engineering advances.



Salt makers throttle costs with a steady flow of improvements in equipment, operating methods and processes. Here's a fresh look at the . . .

Engineering in Salt Manufacture

W. L. BADGER and F. C. STANDIFORD

Greater steam economy and increased use of power are the main features which set today's salt plant apart from its predecessor.

Since 1921, when the senior author first detailed the artificial evaporation of salt,[1] many engineering advances have been made. Changes in equipment and operating methods have accompanied the replacement of manual labor with mechanical power.

More Power, Lower Costs

An important fact in the salt industry is that the evaporators will almost invariably take more steam than can be produced as exhaust from the power units. This delayed modernization of salt power plants for a long time.

In 1921, the average salt plant generated its steam at 125 to 150 psig. This may have been used to

- Drive a Corliss engine, which in turn drove a generator that distributed electrical power to a few points.
- Drive a Corliss engine, which drove a main shaft from which power was taken off by belt and rope drives at the various points of used.
- Drive small reciprocating engines placed wherever power was needed. The steam was piped directly from the boiler to the individual engines.

At present, steam is raised to up to 600 psig. in modern, stoker-fired boilers. Passing this high-pressure steam through a turbogenerator generates all the power used in the plant as electricity. Exhaust steam from this system, plus makeup high-pressure steam is used in the evaporators and grainers.

Grainers Nearly Unchanged

The grainer process for refining salt has been described several times.[1, 2, 3] A grainer is a flat open pan, 15 to 20 ft. wide, 150 to 200 ft. long and about 2 ft. deep. Steam coils are submerged in the pan, and a system of reciprocating rakes is at the bottom, beneath the coils.

Brine in the grainer is kept at a temperature just below its atmospheric boiling point so that the salt crystals form by slow surface evaporation. This gives very fragile but coarse crystals which grow on the surface for a time, sink to the bottom and are ultimately raked out over a drain board on the end of the grainer.

Grainer construction today is practically the same as in the '20's. However, today's grainers are practically always made of steel, whereas in 1920 some were made of wood or concrete.

As in 1920, brine for today's grainers is rarely purified. But today the composition of the brine in the grainer is carefully watched and a sufficient discard made to keep the concentration of calcium and magnesium chloride from rising too high.

Salt Handling Improved

Salt handling methods have also improved over the years. In 1920, salt left the grainer with a mother liquor, whose purity might have been low, adhering to it. It was neither washed nor dried, merely dumped on the warehouse floor to drain for 30 days or so, then packed.

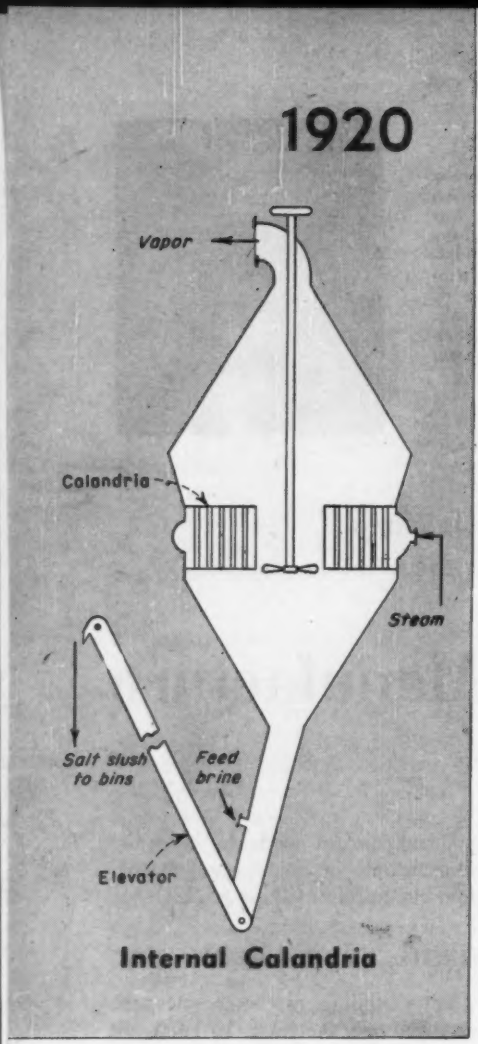
Today the salt leaves the grainer in one of three ways: slurried with purer brine and pumped;* suspended in an elutriation apparatus, in which it is washed by an upward current of brine; or on a belt conveyor. The salt is always filtered, usually on a top feed, continuous rotary filter with provision for drying the salt on the filter.

Preserving the Grain Structure

The factor that has most affected the handling of grainer salt after it is made is the need to preserve its characteristic coarse grain structure.

The old-fashioned rotary dryer broke up too large a percentage of the fragile crystals by its tumbling action. The top-feed filter has supplanted it

* Pumping is not too successful, since the action of the pump usually breaks up the crystals more or less, and it is the coarser fractions of grainer salt that have the highest value.



because with it salt disturbance is held to a minimum.

Nevertheless, it is not always possible to dry salt satisfactorily on a top feed filter, and when the salt must be completely dried, newer dryer designs, such as the Wyssmont or Link Belt dryers, in which the salt is handled with the least possible tumbling and abrasion, are favored.

Grainers on Sufferance

Grainer salt is made today simply because the market demand for coarse salt with this particular structure is sufficient to make it necessary for the salt plant to operate grainers. Steam economy of the grainers is low, and the crystal produced is very fragile, so that getting the desired high-priced coarse fractions is quite a problem. Most salt plants would be glad indeed to get rid of grainers.

The search for steam economy and greater purity has led to some of the modifications of the grainer process that will be described in the second paper. These are, however, either experimental methods or methods that have not gone beyond the pilot plant stage at present.

The Alberger system, which has been described several times, is still operated essentially as it was in 1921, and in one sense of the word the Alberger is a modification of the grainer. The Alberger process produces a typical crystal, finer and more open in structure than the standard grainer, and it has an economy somewhat better than the grainer, but not as good as a double effect evaporator. Consequently the Alberger process, though it is still operated by one company, will probably not be adopted in any other plants.

Vacuum Pans Producing More

Backbone of the salt industry today is the vacuum pan.

A larger and larger percentage of the total salt produced is being made in multiple effect evaporators. The term "vacuum pan" is commonly used in the salt industry because salt was always made in the beginning in open pans, and when the multiple effect evaporator was introduced it was looked on as a modification of the old open pan—simply run under a vacuum.

In 1920 the salt evaporator was always a vertical short-tube calandria evaporator of the standard type, usually with a propeller in the downtake. Salt was removed by prolonging the bottom cone into an elevator boot, and a bucket elevator carried the salt out of the bottom of the evaporator and discharged it into drainage bins (see drawing above). This was considered excellent practice at the time, but is now completely obsolete. The salt elevator ran part of the time in brine and part of the time in air, and therefore corroded rapidly, not only wearing out the elevator but producing dirty salt. The elevator discharged a very sloppy mixture into the drainage bins, where it never drained completely but left a very wet mass to be handled in the driers.

As the need for greater and greater capacities increased, the bodies became so large that they became unwieldy. This type of evaporator could not use tubes over 5 ft. long and these tubes had to be at least 2½ in. in diameter because of the cleaning tools used. Consequently, an increase in capacity of the evaporator meant an increase in the diameter of the body until it got to be very large.*

Forced Circulation Reduces Size

Most of these old evaporators are still running. More recent ones, however, are of the vertical-tube, forced-circulation design with external heaters, as shown on p. 175. This depicts a relatively recent unit built by the Swenson Evaporator Company. It has many advantages over the old design, and these will be discussed in greater detail in succeeding paragraphs; but one particular advantage is that the evaporator stays within reasonable bounds as to size.

Body diameter is no longer dictated by the number of tubes it has to contain, but only by the velocity of the vapor leaving the salt solution, and therefore is much smaller than formerly. The forced-circulation tube bundle may have as many square feet of heating surface as some of the older evaporators, but because of the type of construction it is very much smaller. It is possible to add more capacity by simply adding heaters to a given vapor body.

A fair comparison of the two designs is the fact that one salt plant recently has installed a quintuple effect forced-circulation evaporator in the space formerly occupied by two effects of a quadruple effect of the old design. The new evaporator has appreciably higher capacity than the old one.

Swing From Cast Iron to Monel

The old evaporator was always made of cast iron with copper tubes. The cast iron was moderately resistant to corrosion, but not entirely so, and some of these old evaporators today, after 20 or 30 years' service, are getting dangerously thin. Today's construction involves more resistant metals that result, not only in longer probable life of the equipment, but also in less contamination of the salt with metal impurities.

* Some evaporators have been built as large as 30 ft. in diameter.

In the past this has not so much been a contamination by iron in the form of soluble iron, which resulted in red salt (although this was always the case), but the principal difficulty with the old pan was that the salt was full of black specks of iron oxide and graphite from the cast iron. Today's metals eliminates both soluble contamination and contamination by specks.

There has been considerable discussion as to the relative merits of stainless steel and monel, the balance today being struck in favor of monel. The vapor heads are usually built of monel-clad sheets, and the heating elements have monel tubes and monel tube sheets. Internal piping in the evaporator is monel or, in the case of very large sections, fabricated from monel-clad steel.

Monel metal is attacked by sulfur compounds, and most brines contain small amounts of H_2S. This can be completely removed, however, by making the brine slightly acid, and then blowing with air in a packed tower. The new construction has an advantage not entirely summed up in the previous sentences, but this will be discussed in a succeeding paragraph.

Removing the Salt

Today's evaporator has the lower end of its cone bottom prolonged in an elutriation leg. The salt slurry is pumped from the bottom of the leg to a settling tank. By feeding part of the incoming brine into the bottom of the elutriation leg, it is possible to wash out the fine crystals, to wash back some of the soluble impurities, and to wash back fine calcium sulfate crystals. This means that the salt leaving the evaporator is suspended in a brine of definitely greater purity than that in which it was made.

The evaporators are usually high enough so that the bottoms of the elutriation legs are under atmospheric pressure or greater, and therefore the withdrawal of the slurry is not difficult. Slurry from all effects is sent to a common settling tank, which may or may not have an elutriation stream of fresh, purified brine. Overflow contains fine salt crystals and fine calcium sulfate crystals which are returned to the evaporator with the feed. Underflow goes to a top feed filter.

The reason for returning the fine calcium sulfate crystals to the evaporator will be taken up later.

Attaining High Salt Purity

Salt is almost always made from brine saturated with calcium sulfate and containing appreciable amounts of calcium and magnesium chlorides. Few operators in this country find it possible to chemically purify the brine. The consumption of sodium carbonate to remove completely the calcium sulfate results in excessive costs. Consequently, practically all salt evaporators today run on unpurified brine.

However, the calcium and magnesium chloride content of the mother liquor is watched, and a sufficient bleed taken off the evaporator to hold this concentration of soluble impurities at a desired level. This level is such that washing in the elutriation leg, washing in the setting tank, and washing on the top feed filter are enough to keep the calcium chloride and magnesium chloride content of the final salt within desired limits.

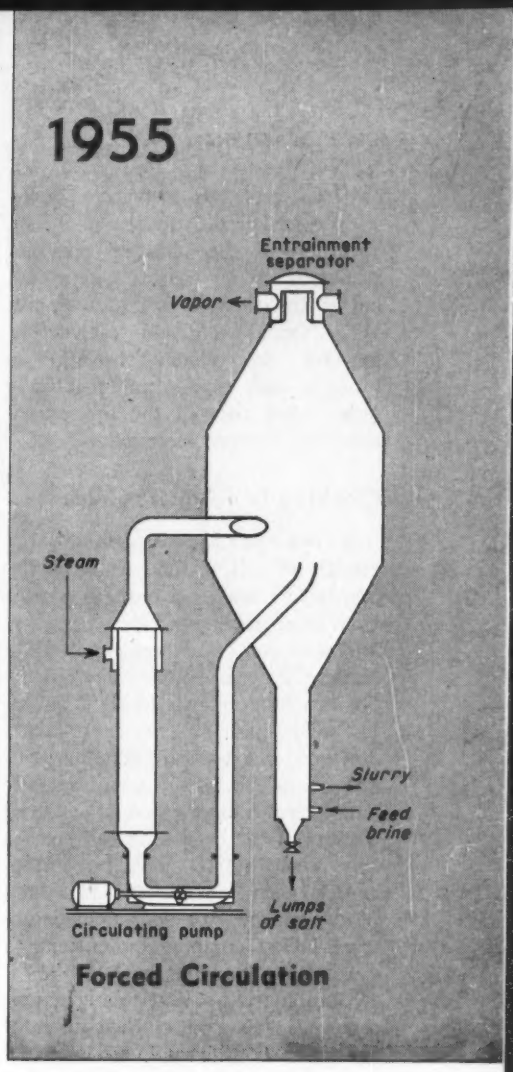
It is possible by such methods to make the salt considerably purer than 99.5% in day in and day out operation.

Eliminating Tube Scaling

In 1921, the average evaporator often had to be boiled out daily or even twice a day to remove crusted salt and the tubes had to be drilled at least once a week to remove calcium sulfate scale. Today calcium sulfate scale is not a problem.

The principal method by which scale has been prevented has been by carrying a rather considerable concentration of suspended calcium sulfate crystals in the brine in the evaporators. The purpose is to have so many calcium sulfate crystals present that all the calcium sulfate thrown out of solution can grow on these crystals rather than growing on the tubes. It has been possible to operate for as long as one or two years without ever having to drill out a salt evaporator, even though it is running on unpurified brine.

The above statement of the method is greatly over-simplified. Many features of the process are not well understood today, and each plant has its own specific variations of this method of operation.



Since calcium sulfate scale no longer has to be drilled out, evaporator tubes do not have to be large enough to run a drill through them. This permits use of smaller tubes in the heating element of a forced-circulation evaporator, and the building of a much more compact heating element than was possible 30 years ago.

Less Salting Means More Savings

A second cause of interruptions in evaporator operation is salting. This is the growth of salt on the heating surfaces in the form of crusts, instead of on crystals freely suspended in the solution. The mechanism of salting and the factors that cause it are still unknown, but it is believed that higher velocities and heavier slurries of salt decrease the rate of salting.

Old evaporators used to be boiled

out from every day to twice a week—in exceptional cases, twice a day. The operation of the old-style calandria evaporators today has been improved, but it still is necessary to boil out. With forced-circulation evaporators, however, the velocity through the tubes is such that salting practically never takes place in the tubes, and, therefore, boilouts are rare.

Combing Is a New Problem

A new problem is combing—the growth of salt on the walls of the evaporator body. Combing comes from brine splashes or spray.

It was not a real problem in 1921 because the evaporators were usually not run long enough to allow an appreciable amount to accumulate. However, in a week's run combing can grow thick enough to become actually dangerous. A large piece falling from the top of the evaporator can crack a tube sheet, a section of the bottom cone, or blend a propeller blade. Men have narrowly escaped serious injury from falling combing on entering a evaporator after a long run.

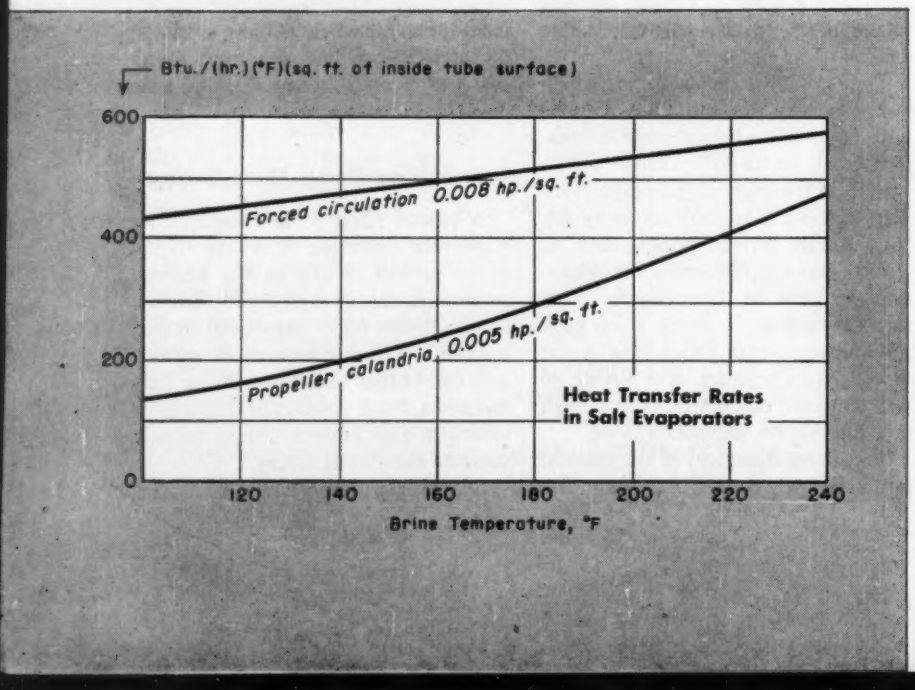
Combing is not particularly serious as long as it stays put on the evaporator walls. Most of the trouble comes when pieces of combing fall into the brine. These pieces plug slurry outlets and, in a forced-circulation evaporator, are plastered against the inlet ends of the tubes by the circulating pump. This stops circulation in the tubes so obstructed and they rapidly fill with salt.

Wall Surface Holds the Answer

It follows, then, that evaporator walls should either be so smooth that combing can't start to form or so rough that all combing is held in place. The gradual development of longer and longer boilout cycles has been accomplished primarily in plants having old cast iron evaporators. The corroded surfaces of these old evaporators held the combing in place so well that it did not affect operation.

Most of the combing difficulties encountered recently have been with new evaporators. One such plant having calandria type evaporators with propellers can run only 12 hours before pieces of combing in the slury outlets cause so much trouble that the evaporator must be boiled out. Another plant using a forced-circulation evaporator with cast iron bodies had to be parboiled every day to clean out tubes plugged by pieces of combing. This evaporator was finally lined with wire mesh to hold the combing in place on the walls.

In another case, the performance of a forced-circulation heater attached to an old cast iron body was excellent, but a practically identical heater attached to a new monel body gave considerable difficulty when first tried. However, the monel walls soon became polished by action of the salt crystals in the brine, and the suction line to the circulating pump was altered to keep most of the loose combing out of the circulating system, so that the combing troubles were soon eliminated.



Cleaning Evaporators by Boilouts

While the term "boilout" is commonly used for cleaning salt evaporators, it is very seldom that the evaporators are actually boiled out. Usual practice is to fill the evaporator with cold water and circulate until the combing dissolves. The brine in the evaporator bodies is usually saved in tanks and stirred with compressed air before returning to the bodies. This permits saving the calcium sulfate seed crystals necessary for the prevention of scale.

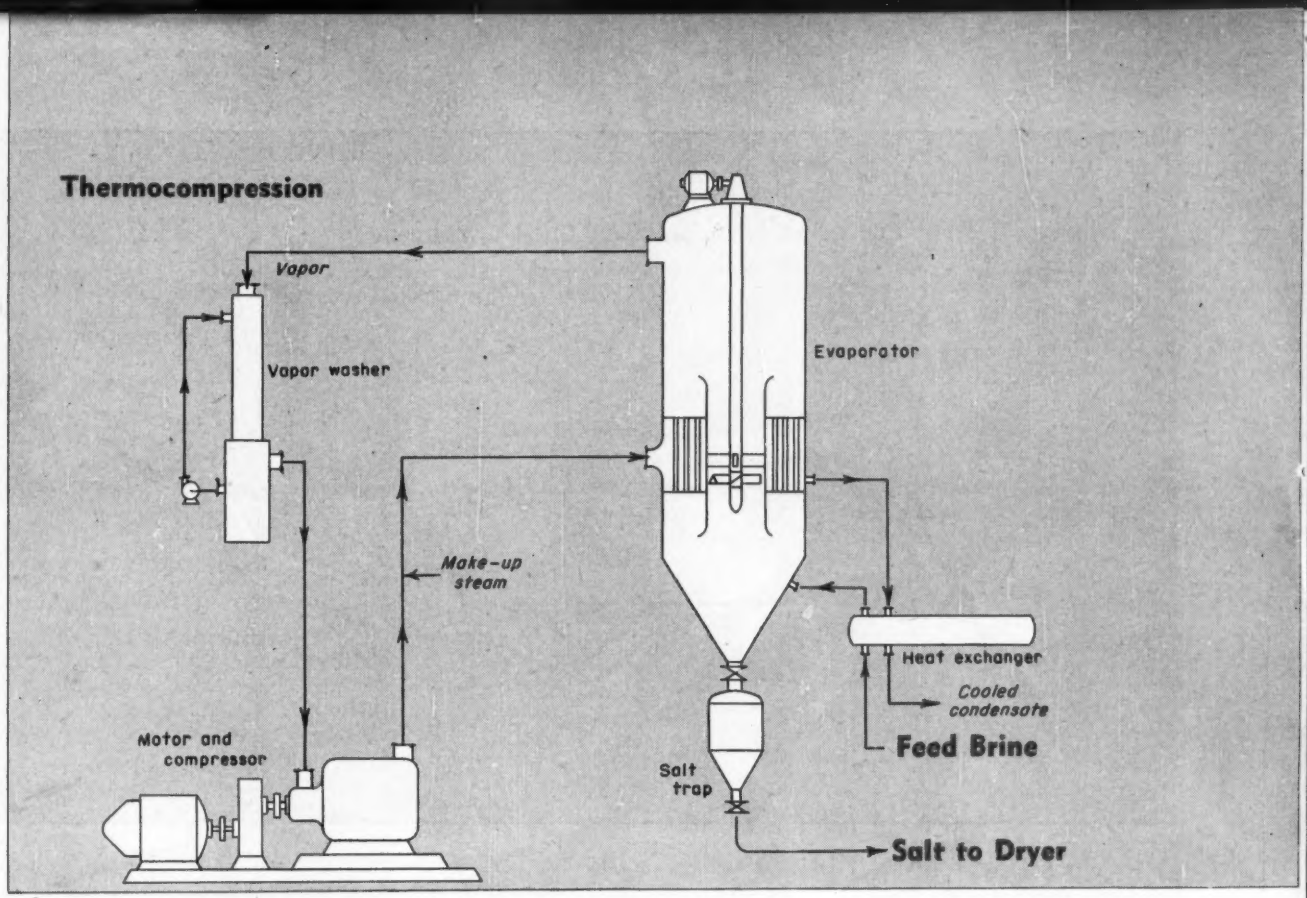
Some salt evaporators, especially forced-circulation machines, are cleaned by a simple parboil. The brine feed is shut off, the level allowed to drop, and the bodies are then rapidly filled with water. As soon as this water has evaporated and the level has returned to normal, brine feed is resumed. Steam flow and circulation are never stopped during a parboil and this permits much more rapid cleaning. However, these parboils make it hard to control calcium sulfate seed crystal concentrations and hence are not often used where scale is likely to be encountered.

Recent information indicates that forced circulation evaporators can run for indefinite lengths of time without requiring a boilout. This is a noteworthy accomplishment since, by eliminating the biggest cause of downtime, it greatly reduces costs. It is not possible for anyone outside of the salt industry to realize what a very radical and remarkable achievement this is.

Improving Evaporator Economy

In 1921 the average salt evaporator was a double, or less frequently a triple, effect. With the need for continually increasing steam economy as costs went up, more and more effects have been added until the standard evaporator today is usually a quadruple effect, with some quintuples in operation. In this case the forced-circulation type of evaporator has proved to be particularly advantageous.

It has been the practice since about 1900 to increase the steam economy of salt plants by the addition of extra effects to an existing installation. This



could usually be done only with some loss of capacity when the added evaporators were the calandria type, illustrated on p. 174. Today, capacity can usually be increased while still increasing the steam economy, if a forced-circulation evaporator is used for the additional effect.

Reason for this is shown in the graph, which is based on a number of tests of different evaporators. Heat transfer coefficients for calandrias are very low at the low temperature existing in the last effect of the evaporator. The last effect, therefore, uses up most of the available temperature difference. Heat transfer coefficients with forced-circulation, on the other hand, are high and relatively insensitive to temperature.

Therefore, by adding a forced-circulation last effect, the heat transfer rate at the low temperature is improved. At the same time, the average temperature in the old calandria effects is increased, thereby increasing heat transfer coefficients in those bodies as well. Changing a triple to a quadruple effect in this manner will usually increase capacity about 15% and reduce steam consumption per ton of salt by 25%.

Where Fuel Is High

Thermocompression, while not a factor in the U. S. salt industry, is widely used overseas. All plants are located in areas where cheap hydroelectric power is available and fuel is expensive. By far the largest number are in Switzerland.

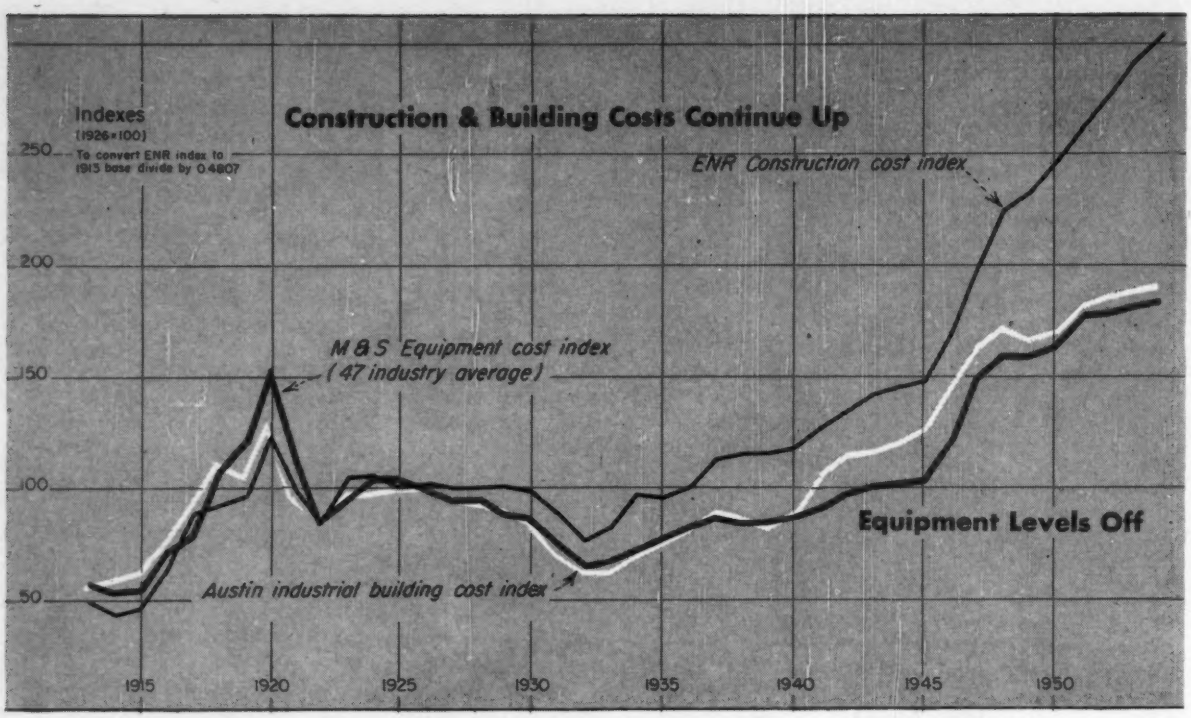
Thermocompression has been used most often for salt manufacture in conjunction with vacuum pans. A typical flowsheet is shown above. Vapor from the boiling brine is freed of entrainment and compressed to a pressure high enough to serve as the heating medium of the evaporator. This compressed vapor supplies enough heat for evaporation of the water from the brine, but not enough to preheat the feed brine to the boiling point. It is thus necessary to have an auxiliary source of heat and a system of heat exchangers for recovering heat in the condensate.

The principal advantage of a thermocompression salt plant is that the heat theoretically equivalent to the power consumed by the compressor is much less than the heat content of steam used in a multiple effect evaporator. Published results[4] indicate a total consumption of 300 kwh. per short ton of salt produced. The thermal equivalent of this is 1,020,000 Btu. per ton of salt, as compared to 2,600,000 Btu. per ton for a quadruple effect vacuum plant. Both of these figures include allowances for pumps, driers, filters or centrifuges, etc.

At first glance, these figures show a very great saving for the thermocompression plant, but, unfortunately, power cannot usually be generated at anything like the efficiency that steam can. A fairly good heat rate for central station steam power plants is 15,000 Btu. per kwh. Even making no allowances for transmission or conversion losses, the primary heat requirement of a thermocompression plant supplied by any means from a heat source would be 4,500,000. Btu. per ton of salt. Thus, where power can be generated economically from coal, oil, or gas, a thermocompression plant is uneconomical.

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How Equipment Costs Are Moving

Tabulated below are the annual average indexes of comparative equipment cost for eight process industries and four related industries, prepared by the evaluation engineering firm of Marshall and Stevens, Incorporated of Illinois, Chicago 4. Extending from 1913 through 1954, the annual averages are supplemented by the quarterly figures on the individual charts at the right.

A tabulation appears each month in the Process Equipment News section, showing latest revisions for the quarters ending March, June, September and December.

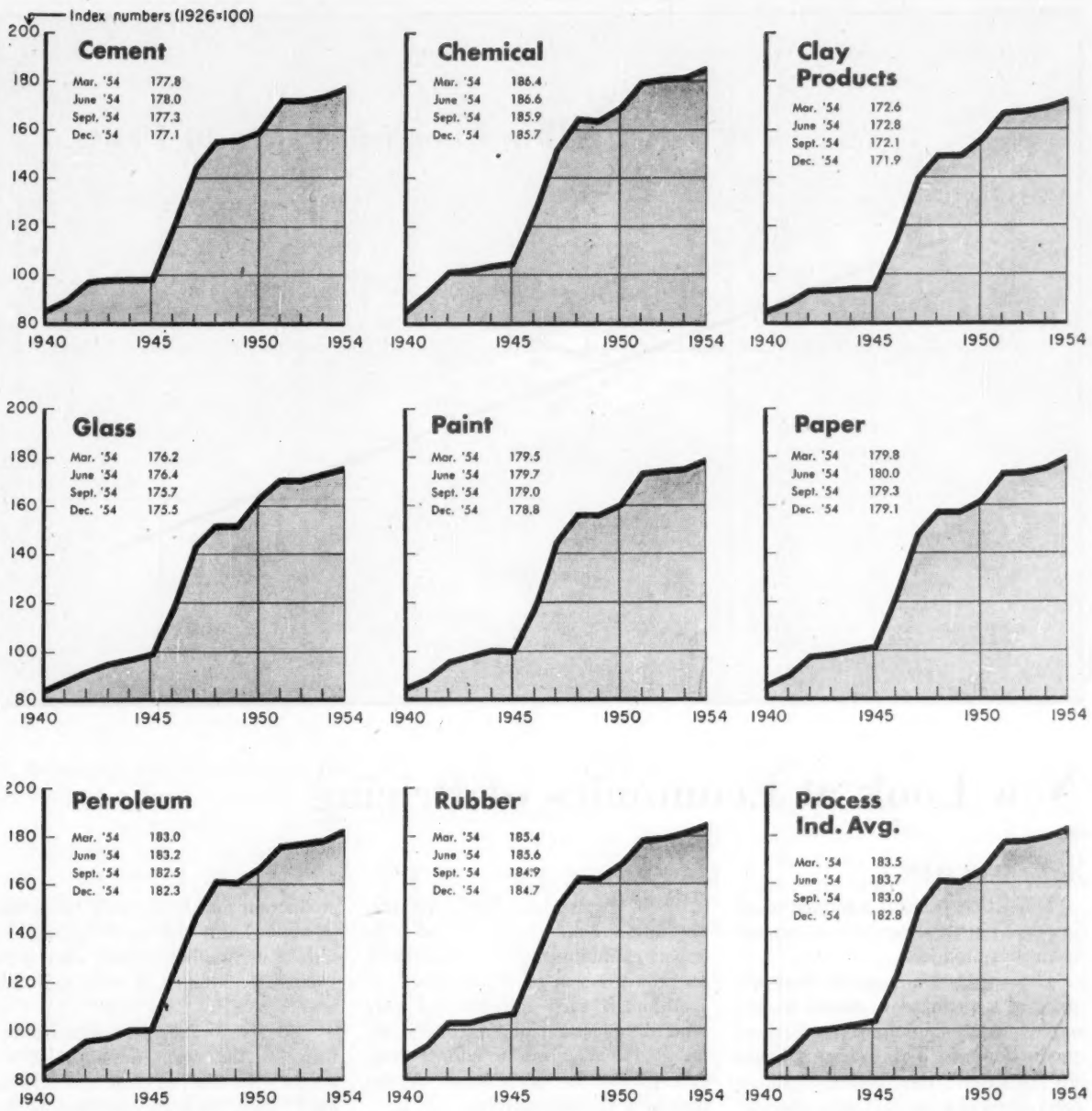
This feature was introduced initially on pages 124-6 of our November 1947 issue, in an article by the late R. W. Stevens, partner of the firm, which described the basis for the 47 industry indexes regularly issued by the firm, and the method of weighting the process industry average.

Charted above is the M & S 47-industry average plotted on the same grid with the Austin Co.'s index of industrial building costs, and the *Engineering News-Record* index of heavy construction costs.

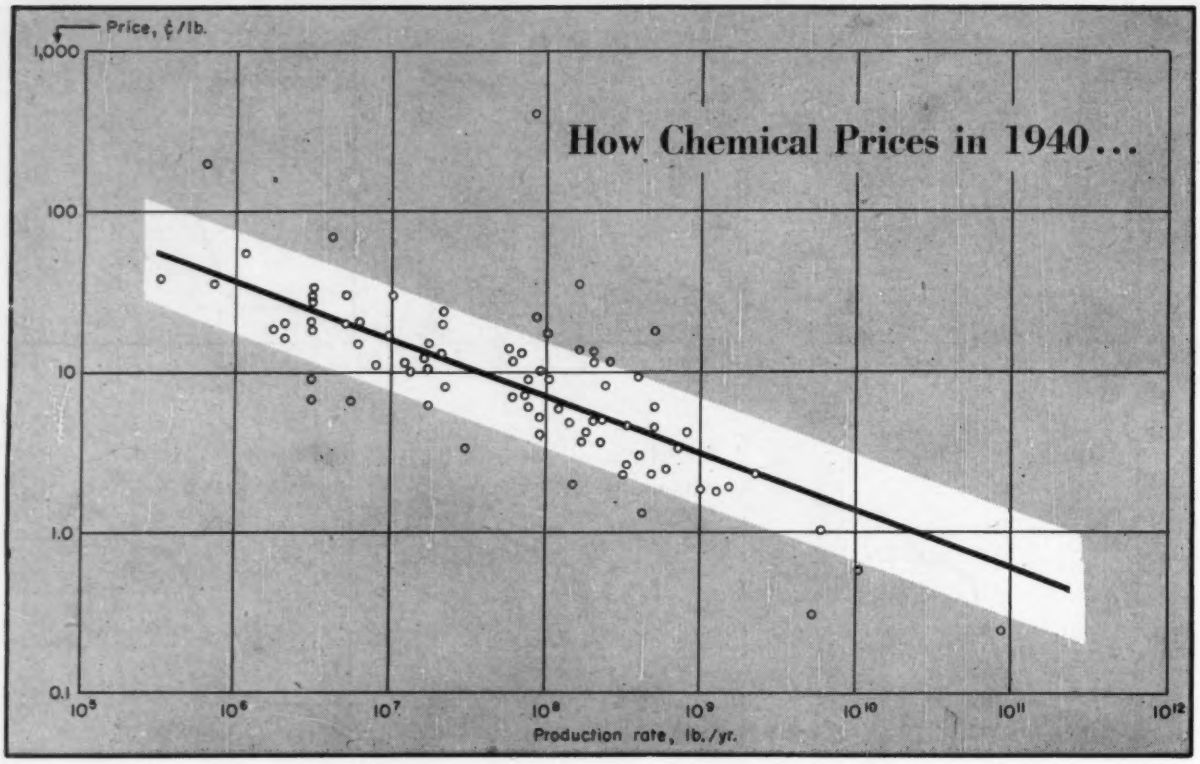
All process industry components of the M & S index held quite constant in 1954, with slight decreases in the last two quarters.

Marshall and Stevens Annual Indexes of Comparative Equipment Costs, 1913 to 1954 (1926 = 100)

Industry	1913	1916	1918	1920	1922	1924	1926	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
Average of all	57.9	62.8	109.7	153.3	85.5	105.3	100.0	96.5	91.9	87.0	76.9	66.1	69.4	74.6	78.0	81.6	88.3
Process Industries																	
Cement mfg	58.0	62.5	109.1	149.2	83.7	104.6	100.0	97.2	92.5	87.0	76.8	68.9	70.7	75.7	78.1	82.2	88.8
Chemical	59.0	63.0	111.9	150.5	82.5	105.6	100.0	96.9	92.4	82.0	78.0	77.6	70.9	75.4	78.5	82.5	88.2
Clay products	60.7	65.3	120.0	154.3	82.9	105.7	100.0	97.0	91.7	86.1	78.0	70.6	71.1	75.7	79.3	83.2	87.8
Glass mfg	58.7	63.5	112.1	151.1	83.7	101.9	100.0	95.9	92.1	86.6	77.9	69.4	71.2	75.4	78.5	82.6	88.0
Paint mfg	58.2	62.8	108.0	148.5	84.1	104.0	100.0	94.6	91.7	85.7	76.6	71.7	70.1	74.6	77.2	81.5	87.4
Paper mfg	60.4	63.4	111.8	152.6	83.1	105.6	100.0	96.8	90.9	86.5	77.1	67.2	69.9	75.4	78.5	82.7	83.1
Petroleum ind.	58.9	64.1	113.0	151.5	82.7	106.0	100.0	97.1	92.0	86.2	77.6	70.1	70.6	76.0	78.7	82.6	87.8
Rubber ind.	58.6	63.8	113.8	154.2	88.0	105.9	100.0	91.9	91.9	86.2	77.0	67.1	70.7	75.2	78.1	82.2	88.4
Related Industries																	
Elec. power equip.	59.1	64.3	114.2	152.2	83.6	106.0	100.0	96.9	91.8	86.1	78.1	70.1	70.7	75.5	78.7	82.7	87.9
Mining, milling	56.8	62.9	111.9	149.9	82.8	105.6	100.0	97.2	92.9	86.7	76.8	67.6	80.0	85.6	88.5	92.4	97.1
Refrigerating	59.3	63.2	113.5	153.5	83.9	96.1	100.0	97.0	92.0	86.4	75.0	70.0	71.3	75.4	78.9	83.0	87.5
Steam power	59.1	64.3	114.2	152.2	82.7	106.1	100.0	96.9	91.8	86.2	88.1	70.1	70.7	75.5	78.7	82.7	87.0



1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	
84.4	84.8	86.6	92.6	99.6	100.5	102.4	103.4	123.2	150.6	162.8	161.2	167.9	180.2	180.5	182.5	184.6	Average of all
85.2	84.6	85.4	90.8	97.8	98.3	98.6	99.4	119.7	144.3	156.5	156.6	161.6	172.7	172.8	174.6	177.6	Cement mfg.
84.4	83.8	84.6	93.3	102.0	103.1	105.6	106.5	126.8	151.5	164.5	164.5	169.6	180.7	181.1	183.1	186.3	Chemical
83.2	82.7	83.7	87.6	93.1	93.6	93.9	94.8	115.0	139.8	151.5	151.5	156.6	167.7	167.7	169.5	172.4	Clay products
83.4	83.0	84.3	88.2	93.7	94.7	96.5	97.4	117.6	142.3	154.6	154.6	159.7	170.8	171.0	173.0	176.0	Glass mfg.
83.9	83.9	84.9	90.3	97.3	98.3	100.1	101.0	121.2	146.0	157.8	157.8	162.9	174.0	174.4	176.3	179.3	Paint mfg.
84.8	84.1	85.1	90.5	97.5	98.7	101.3	102.2	122.4	147.0	158.1	158.1	163.2	174.3	174.7	176.6	179.5	Paper mfg.
83.3	82.3	82.8	88.2	95.2	96.7	100.0	100.9	121.6	147.2	160.9	160.9	166.0	177.1	177.6	179.7	182.8	Petroleum ind.
85.4	85.3	86.3	94.2	102.7	103.7	105.5	106.4	126.6	151.2	163.3	163.3	168.4	179.5	180.0	182.1	185.2	Rubber
84.3	84.1	85.8	90.5	96.5	97.5	99.3	100.2	122.9	150.0	166.1	166.1	171.2	182.3	182.8	184.9	188.1	Elec. power equip.
92.6	92.1	93.1	98.5	105.5	106.2	107.3	108.2	128.4	153.0	165.2	165.2	170.8	181.4	181.9	184.1	187.2	Mining, milling
83.0	82.1	83.1	89.0	95.8	97.0	100.1	101.7	125.7	162.2	176.7	175.8	185.2	200.1	200.7	202.8	204.9	Refrigerating
82.2	81.7	82.7	86.6	92.1	92.8	93.9	94.8	116.0	141.7	153.2	153.2	158.5	169.9	170.5	172.6	175.7	Steam power



New Look at Economics of Pricing

S. C. SCHUMAN

This article presents a correlation of prices of chemical products vs. annual quantities produced.

The correlation suggests that the price of a chemical is related to and approximately determined by its total production rate. This relation contains no "demand" term, and thus differs from classical economic price theory.

Although derived from data for chemical products, this relationship and its obvious corollaries may find more general application.

Data used were U. S. prices and production rates for a number of chemical products during 1940-1948, obtained from "Industrial Chemicals."[2]

This source was advantageous in that data were given for a limited but adequate number of chemicals in a single work.

The data are subject to some inconsistencies. For example, prices are not on uniform bases with respect to package unit or freight costs. In certain cases the data do not distinguish between various grades of the same products. Of greater importance, production rates are not clearly defined with respect to intermediates manufactured for production of other chemicals.

Although such uncertainties may limit the precision of the correlation, no attempt was made to correct these factors. On the other hand, all the data used were adjusted by:

1. Conversion of volumetric units (such as gallons) to pounds.
2. Conversion of data for chemicals marketed in aqueous solution to a 100% nonaqueous basis.
3. Conversion of data for solids containing water of hydration to an anhydrous basis.
4. Correction of obvious errors.*

The graphs above present price-production rate data for 1940 and 1948, plotted on logarithmic scales. The data are reasonably represented by straight lines of the form

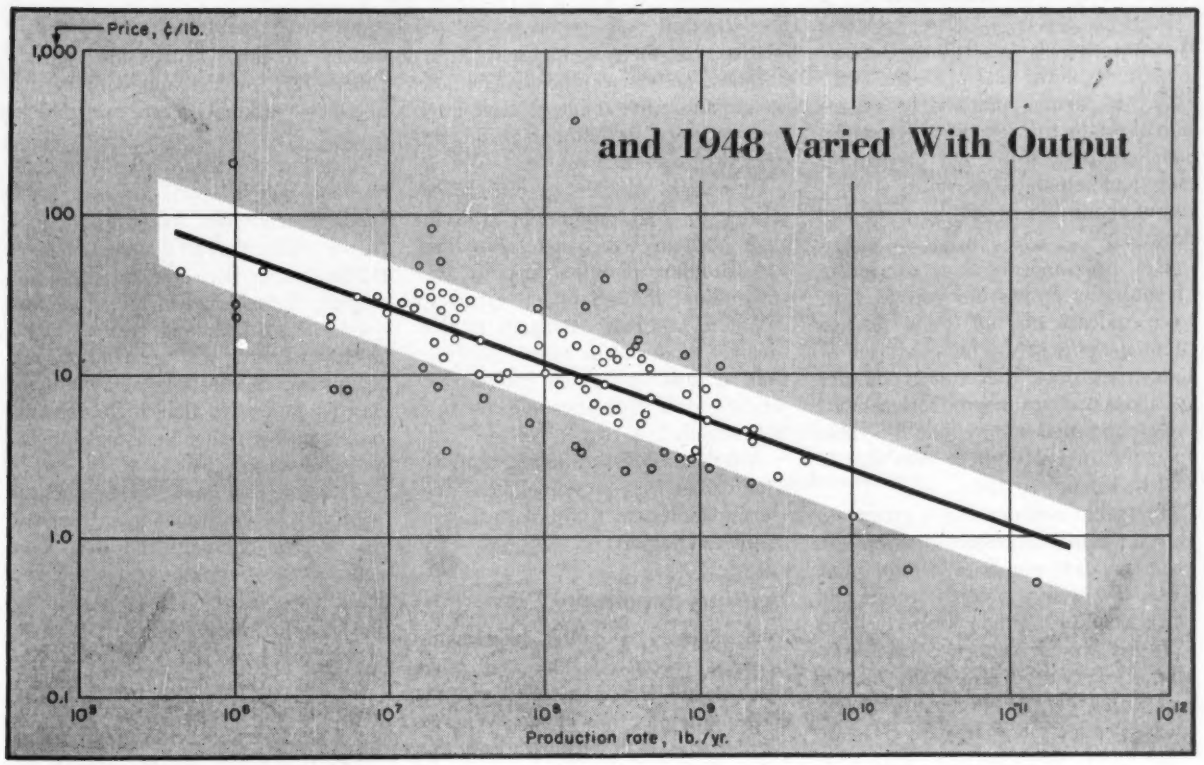
$$P = bR^m \qquad (1)$$

where P and R represent price and production rate respectively, with the plausible limits that as R approaches zero, P approaches infinity, and as R approaches infinity, P will approach zero.

The straight lines were obtained statistically; the mean deviation of all points from the 1948 line is ± 0.35 in log P. Thus the price indicated by the line at a given production rate varies from the true price, in the mean case, by a factor of about two.

This range of deviation is not small; obviously, price could not be predicted from production rate alone with any high degree of accuracy. However, the correlation between price and production rate is undoubtedly significant, when we consider that it includes products as diverse as lime, sodium, oxygen and pentaerythritol, prepared from many different raw materials by widely differing processes, with annual production rates ranging all the way from 300,000 lb. to 150 billion lb. and prices ranging from 0.3¢ to as much as $4 per lb.

*The prices of benzene and formaldehyde as reported in the book are incorrect.



Solving for constants b and m describing the 1948 line, we get

$$P_{1948} = 55.4R^{-0.346} \quad (2)$$

Production rate R, in million lb. per yr., represents a real material entity. However, price P in ¢ per lb. is a more abstract quantity; it expresses the amount of United States currency for which 1 lb. of a given chemical was exchangeable in 1948. Since the "value" of such currency varies from year to year, let's see how data from the same source correlate for 1940.

The statistically determined equation for 1940,

$$P_{1940} = 34.5R^{-0.346} \quad (3)$$

shows an almost exact correspondence of the exponential term with that indicated for 1948 in Eq. (2). This suggests the hypothesis that the exponent (slope of the log-log plot) may be an economic factor of some significance.

Eqs. (2) and (3) may be expressed as

$$P_1/P_2 = (R_1/R_2)^{-0.346} \quad (4)$$

where P_1 represents the price at production rate R_1 and P_2 the price at a different production rate R_2.

Eq. (4) is similar in form to the so-called "power rule" relating plant size and cost as suggested by Williams,[4] Nelson,[3] Chilton[1] and others. This rule is expressed as

$$C_1/C_2 = (S_1/S_2)^n \quad (5)$$

where C_1 represents plant capital cost at plant capacity S_1, C_2 at plant capacity S_2 and n is an exponent which is positive and less than 1.0.

If the power rule is expressed in terms of capital charges per unit of production K, then

$$K_1/K_2 = (C_1/S_1)/(C_2/S_2) = (S_1/S_2)^{n-1} \quad (6)$$

where K_1 and K_2 are the respective unit capital charges. If the power rule is also applicable to raw material, labor and other costs, and if the price per unit is proportional to the summed costs, then

$$P_1/P_2 = (S_1/S_2)^y \quad (7)$$

where y is the average weighted exponential for the component costs.

Surveying available data for plant capital costs, Chilton reported average and median values of n as 0.66 and 0.68 respectively. The corresponding values of n–1, –0.34 and –0.32, are strikingly close to the exponents –0.344 and –0.346 in Eqs. (2) and (3).

As derived from an extension of the power rule, however, Eq. (7) involves only a single chemical produced by the same process at two different production levels, whereas Eqs. (2) and (3), within the indicated average error, involve different products, different raw materials, different processes and different capital and operating costs. In addition, R represents the total annual production rate, which could comprise the output of one production unit of R capacity or more than one production unit of various smaller capacities.

Thus, whereas the form of Eq. (7) and the value of the exponent determined by Chilton are similar to those of Eqs. (2) and (3), the latter equations are considerably more general and pose questions of broader scope.

The center of gravity ("log average") for the 90 points in the 1940 plot is 56.4 million lb. and 8.54¢ per lb. In the 1948 plot the log average production is 114 million lb., and the log average price is 10.9¢ per lb. These data thus indicate a price rise of about 30% between these years.

On the other hand, comparison of the coefficients in Eqs. (2) and (3) indicates a price rise of about 70% between the years 1940 and 1948 for chemicals produced at the same rate.

It seems obvious to attribute the low magnitude of the real price rise (i.e., 30%) to savings obtained by expansion of productive capacity. We might conclude that, if over-all production rates had remained constant, a price rise of about 70% would have actually occurred.

Real price indexes show an average of consumer costs from year to year. Such indexes do not show relative profit margins of various producers or industries, since they don't consider collateral changes in production rates. An expanding economy should be able to maintain lower prices than one in which demand is static.

Inorganic chemicals as a group are priced lower at a given production rate than are compounds of carbon. For 1948, low average production rate and price were 240 million lb. per yr. and 7.5¢ per lb. for inorganic chemicals, compared with 78 million lb. per yr. and 15.2¢ per lb. for organics. Log average price of inorganics is only 89% that predicted by Eq. (3), whereas the price of organics is 119% that predicted by the equation.

Such differences are hardly due to higher costs of carbonaceous raw materials or to greater difficulties in producing carbon compounds. Carbonaceous raw materials (natural gas, coal, petroleum) are generally available at about 0.5¢ per lb.; this cost will affect the production-price correlation only at its rightmost extremity. Since most of the organics here are liquids, they are probably handled more cheaply than the prevalently solid inorganics. Furthermore, the organics are produced under conditions which seem to be no more costly than those required for production of many inorganics (such as ammonia, sodium, hydrochloric acid and nitric acid).

More probable explanations for the observed differences are (1) the prevalence in the production of inorganics of double-decomposition reactions which produce undesired byproducts in large quantities, (2) the relative "youth" of many of the organics, and (3) the greater specificity of use of the organics.

Other factors seem to contribute to deviations in individual cases. Hazardous materials, such as cellulose nitrate, yellow phosphorus, acetic anhydride and acetylene, are priced high relative to their production rates. Cellulose derivatives, such as cellulose acetate and ethyl cellulose, have large positive price deviations, as do the gases, hydrogen and oxygen.

Chemicals which are priced low relative to their production rates include sodium bicarbonate, disodium and trisodium phosphates, boric acid and sodium thiosulfate. A feature in common to these chemicals is that they are produced by simple reactions from materials which are produced in much greater quantities and are thus of relatively low cost.

A generalized price theory, more accurate than that presented here, will require additional study of these miscellaneous factors.

Demand, Supply and Price

If there is a causal relationship between production rate and price, production rate is more likely the cause and price the effect. Whereas we can reasonably postulate that high production rates reduce unit costs and thereby promote lower prices, we have no basis for assuming that low prices cause high production rates.

Human needs, desires and ability to pay provide the impetus to production. Let us say that production is caused by "demand," and that production rates can be correlated with demand.

This causal chain predicts that high demand causes a high production rate which, in turn, causes low prices. Conversely, low demand with consequent low production rate causes high prices.

This line of reasoning leads to conclusions which seems to contradict classical economic theory. Classical theory states that if demand exceeds supply, prices rise, whereas if supply exceeds demand, prices fall. In other words, high demand causes high prices, whereas low demand causes low prices. In contrast, the hypothesis derived here says that high demand results in low rather than high prices, and vice versa.

The situation described by classical price theory is probably a transient one in the chemical industry, if it actually exists at all. If, at a given price level, demand exceeds supply, the chemical industry will usually increase supply rather than price. As supply is increased to meet demand, price can and does fall because of the lower costs made possible by higher production rates. When demand exceeds supply, there is little incentive for a producer to increase price, when shortly thereafter another producer may expand the supply and reduce his price to a lower level.

Similarly, low demand may not reduce prices materially. The principal effect of low demand is to lower the supply by eliminating the least efficient (usually the smallest) producers. The reduction in price predicted by classical concepts of free competition would merely eliminate the least efficient producers faster, after which prices would rise to former levels. Maintaining the price level actually gives the smaller producer a chance to hang on until demand again rises, and thereby promotes rather than restricts free competition.

High demand produces high prices, as prescribed by classical economic theory, only where the economy is stagnant and unprogressive. There is no evidence that any such condition exists today in the chemical industry.

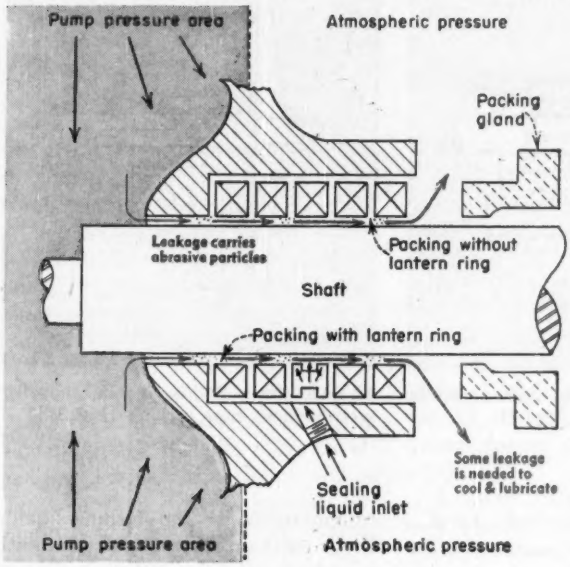


SEYMOUR C. SCHUMAN is associate director of research for Hydrocarbon Research, Inc., Trenton, N. J., where he screens and evaluates all research projects. Although trained as a physical chemist (Ph.D. from Penn State), Dr. Schuman has developed an interest in chemical economics which promises further articles along these lines.

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3. Nelson, W. L., *Oil Gas J.*, **48**, No. 28, 103 (1949).
4. Williams, R., *Chem. Ind.*, **61**, 622-4, 682 (1947).

The Packing Problem: Abrasives Cause Leakage



Some Possible Remedies

Decrease flow of abrasives into stuffing box

1. Move impeller closer to stuffing box.
2. Drill relief holes in impeller back shroud.
3. Restrict channel into stuffing box.
4. Flush abrasives away from entrance to box.

Minimize contact between abrasives and packing

5. Flush packing through lantern ring.
6. Find better position for lantern ring.
7. Improve condition of flushing liquid.

Decrease shaft deflection, if excessive

8. Increase shaft diameter.
9. Operate closer to best efficiency point.
10. Reduce impeller overhang

Improve the packing

11. Investigate possibility of improving packing.

Use seal instead of packing

12. Investigate change to mechanical seal.

Improve pump materials

13. Investigate use of more wear resistant pump parts.

13 Ways to Solve Packing Problems

Shaft and packing wear on centrifugal pumps for abrasive liquids can be serious in process work. Here are 13 ways to solve this frequent problem.

ROBERT D. NORTON

If you are having trouble with your centrifugal pump packing in handling abrasive-carrying liquids, there are half a dozen main lines, and several secondary approaches, to the problem.

First, consider what the problem is. From the drawing above we see that the pump casing is in effect a high-pressure tank connected by an annular passage through the stuffing box to a low-pressure reservoir, the atmosphere. The passage is the space between the shaft and the packing rings, and its open area can be controlled to a certain extent by adjustment of the packing gland. Although the packing is designed to have low friction against the shaft, it is still necessary to have a small flow of liquid through the space for lubrication and cooling. Otherwise, the packing will overheat. This liquid can be either the liquid being handled, or a clear sealing liquid introduced through the lantern ring. Finally, to make the problem more difficult, assume the liquid being handled carries abrasive solid material which will tend to cut the shaft and packing if it gets into the stuffing box.

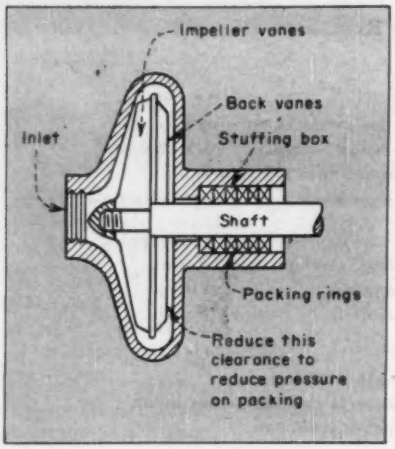
By careful analysis, plant personnel can solve many of the problems with stuffing boxes encountered in handling abrasive liquids. If a pump needs repacking as often as once a month, then the trouble should be investigated to see if improvements can not be made. Probably over 90% of all thin abrasive liquids being handled with centrifugal pumps are pumped in the standard end-suction type with vertically split main casing. This is the kind of pump considered here.

The tabulation given in the box above is both an outline of possible remedial steps, and of the remainder of the article.

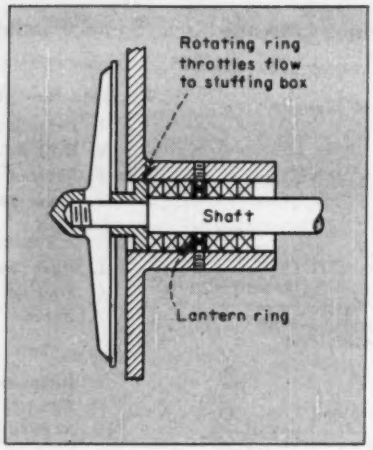
1 Move Impeller Closer To Stuffiing Box

Most pumps handling abrasives are equipped with semi-open impellers, as in Fig. 1. Pump discharge pressure at the outer impeller periphery tends to create flow back of the impeller toward the shaft and out through the stuffing box. Small vanes called repelling vanes on the back of the shroud continuously pump away from the stuffing box and set up a counterflow against the main pumping stream. The size of these vanes and their running clearance from the case backhead affect the stuffing box pressure. Moving the impeller toward the stuffing box reduces the repelling vane clearance, thereby increasing the repelling efficiency and lowering pressure at the box inlet.

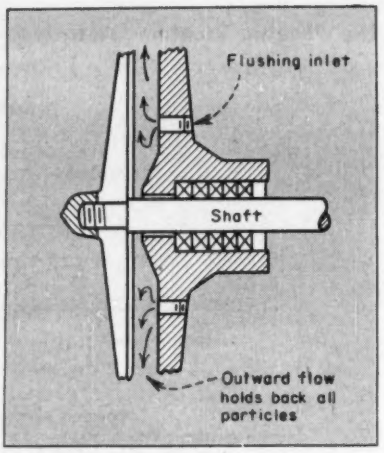
If the vanes are of fair size and are moved close enough to the stuffing box, they will in effect become an effi-



DECREASING repelling vane clearance lowers stuffing box pressure—(Fig. 1)



ROTATING ring seated against packing reduces pump leakage—(Fig. 2)



CLEAR water flushing behind impeller keeps particles from packing—(Fig. 3)

cient secondary centrifugal pump and can be made to reduce the stuffing box pressure to as low as 20 in. Hg vacuum. This extreme, however, is not needed. It is not commercially practical for the pump manufacturer to size the repelling vanes especially for each application. Hence, the user is right in assuming that a great deal of improvement may be possible through adjustment of the impeller if box maintenance is a real problem.

2 Drill Relief Holes in Impeller Back Shroud

Three or four holes drilled in the impeller back shroud near the hub are often used to bleed excess pressure at the stuffing box entrance back to the pump suction eye. The eye is usually at low pressure. Where the suction pressure is close to atmospheric, this arrangement is beneficial in reducing the pressure differential across the stuffing box. However, often the suction pressure is high and bleeder holes will therefore not eliminate the pressure differential, nor reduce the flow through the box which varies directly with the pressure differential.

Use of holes for pressure reduction has its disadvantages. With abrasive liquids, the holes may enlarge rapidly until so much liquid is bypassed that the unit ceases to pump. Again, the holes may be of proper size for one operating condition, but of little help under a new condition. Obviously, there is no adjustment feature in three or four holes of a certain diameter. Finally, bleeder holes will direct a counterflow into the eye of the impeller and may upset proper functioning under delicate conditions, such as very low NPSH operation. However, these disadvantages may easily be outweighed.

3 Restrict Channel Into Stuffing Box

It may be possible to modify the pump design so as to make it more difficult for liquid to get into the stuffing box. For example, one manufacturer furnishes some of his pumps with a bottomless stuffing box, containing a rotating ring fitted to the shaft just behind the impeller. The arrangement is illustrated in Fig. 2. The stationary packing rings seat on this rotating ring. Abrasive wear, if any, is likely to occur on the face of the ring, rather than on the shaft or shaft sleeve. This close running fit performs the function of reducing the channel into the box, and also tends to sling out the solids centrifugally from around the shaft.

The functional idea expressed here can be carried out in almost any competent pump shop, machining the box to a straight-through bore, then butting a rotating bottom ring against the shaft sleeve edge or shaft shoulder.

4 Flush Abrasives Away From Entrance to Box

This system (Fig. 3) is used more widely on sand pumps than on process pumps since it entails quite a bit of contamination by the flushing liquid. Fresh water or other clear liquid must be introduced behind the impeller at about the pump discharge pressure. The liquid flushes the area between casing and impeller back shroud. Then it joins the discharge stream of the pump at the impeller periphery and prevents solid material from getting anywhere near the stuffing box. The back shroud of the impeller must ride close to the case backhead to reduce the size of flow area.

5 Flush Packing Through Lantern Ring

As we have seen, the stuffing box is basically a restricted annular passage, with the flow rate varying directly with the pressure differential across it, and inversely with its cross-sectional area of opening. The area of opening depends partially on how tight the packing is taken up. The limitation on tightness is the temperature rise of the packing from friction, and the resultant scoring of the shaft or shaft sleeve.

To prevent burning and scoring, the packing must have some cooling lubricant. Also, as far as possible the packing must not pick up abrasive solid matter since this is the agent that will grind up both packing and sleeve. One of the best ways to accomplish both purposes is to keep the box area flushed with a clear liquid which will lubricate and cool the packing and shaft, and keep out abrasive solids. The only way to keep out such

solids completely is by flushing ahead of the stuffing box, as in the last section. A more practical compromise is to place a ring with annular liquid passages, called a seal or lantern ring, at about the midpoint of the box, in place of a ring of packing. (Fig. 2 shows such a lantern ring.) The stuffing box is then piped up so that this ring can be flushed continuously with clear liquid under pressure.

If the clear liquid pressure is kept well in excess of the normal box pressure, then the clear liquid will enter the pump stream and also leak out of the box, excluding solids entirely. If the sealing pressure is about the same as the box pressure, there will be relatively little movement of solids-laden liquid through the box. This should reduce packing maintenance and at the same time largely prevent contamination of the liquid being pumped by the flushing liquid. Finally, flushing with liquid at a little less than box pressure will help somewhat by diverting the stream of solid-laden liquid on its way to the atmosphere.

6 Find Better Position For Lantern Ring

Moving the lantern ring toward the impeller will protect more packing rings by its clear-liquid flushing action. However, this makes it more difficult to control the contamination of the pumped liquid by the flushing liquid, since there are fewer packing rings to break down the flushing pressure.

7 Improve Condition of Flushing Liquid

Probably the flushing liquid used to lubricate the packing will not be recirculated. However, if it is, it should be strained to remove the solids if abrasive wear on the packing is severe. This comment applies mainly to flushing liquids which have real value, for example, lube oil—rather than water.

Decrease Shaft Deflection

As an approximate rule, the shaft deflection of a centrifugal pump of the volute type, at its particular operating speed and condition, will vary inversely as the fourth power of the shaft diameter. Deflection varies also with the location of the pump operating point on the efficiency curve, as shown in Fig. 4. Shaft deflection is very low when the pump operates at the best efficiency point, but increases toward shutoff at the left, and decreases toward greater capacity at the right.

A pump operating at small capacity and relatively high head might be particularly suspect if it shows a bad case of stuffing box wear and leakage. In an extreme case I have encountered, a deflection as great as $\frac{1}{32}$ in. occurred with a 1-in. shaft. Leakage and packing deformation followed since the shaft moved away from the packing on one side, permitting a pocket to open between shaft and packing.

Price competition sometimes has influenced pump manufacturers to reduce the size of shafts and bearings. If excessive deflection is indicated the manufacturer should be consulted. He may suggest one of several courses, depending on circumstances.

8 Increase Shaft Diameter

If the shaft appears to be too light, it may be possible to heavy it up if measurements of the stuffing box wall thickness and other pertinent factors show that this casting can be bored out successfully. A shaft diameter increase of only 20% will cut shaft deflection in half.

9 Operate Closer to Best Efficiency Point

It has already been pointed out that shaft deflection is least when the pump operates at its best efficiency point. One source of trouble lies in the over-conservatism of the user's process designer who is inclined to feel he should specify a pump with excess capacity. This often results in moving the operating condition even farther to the left on Fig. 4, where deflection is higher. As an example, if he needs a pump for 10 gpm. at 100 ft. head, he may assume that the operator can throttle down to the required flow so he orders a 15 gpm. pump at 50% overcapacity and a 25% head safety factor, or 125 ft. The manufacturer may then supply a 15 gpm. pump for a little on the safe side of 125 ft. head. When the pump actually gets on the job the operator will throttle it back to 10 gpm., with the result shown in Fig. 5. The designer's conservatism has thus made excessive deflection even worse.

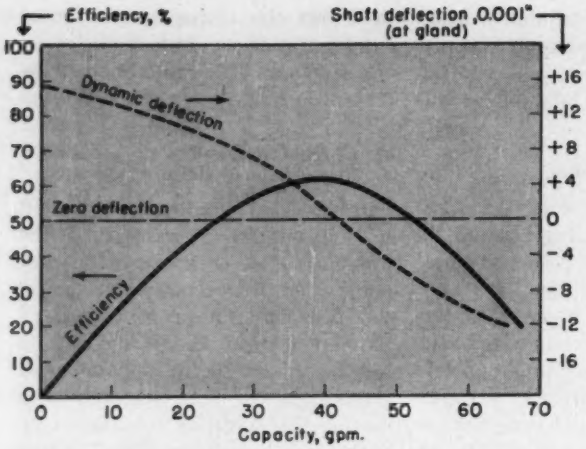
In Fig. 5 the data are fictitious, but the principles shown are sound and suggest a way to get the pump operating at its best efficiency point. Point A represents the actual design point, calling for a 5-in. impeller. Assume that to be conservative the designer specifies Point B, with safety factors applied to both head and capacity. When the pump goes into operation, with the $5\frac{3}{8}$-in. impeller supplied to meet the specification, it operates at Point C when throttled back to 10 gpm. Since this is well to the left of the most efficient point, deflection is serious, say 0.013 in., as compared with 0.009 in. for Point A.

If there is high packing box maintenance and the pump is not working near its point of best efficiency, then shaft deflection may be at fault. Fig. 5 gives us the clue to one simple method of curing the trouble. Consider the possibility of increasing the pump outflow by keeping the system flow the same, but recirculating the excess capacity to the suction. To increase the flow install a larger impeller or increase the speed slightly

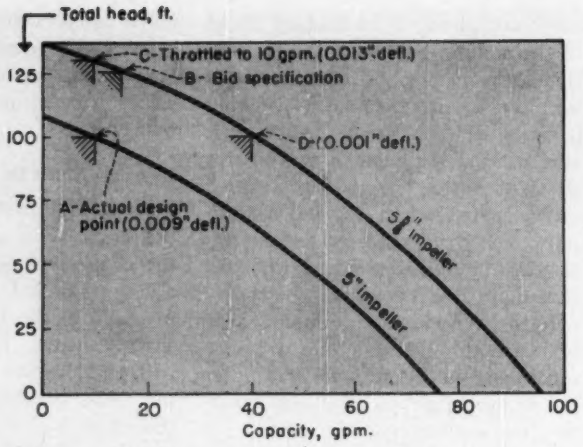


ROBERT D. NORTON is a registered professional engineer who specializes in process pump sales and service. Since 1950 he has dealt extensively with the chemical plants of the Kanawha Valley area, as branch manger of the pump division of Harris Pump & Supply Co., at Charleston, W. Va.

Graduating in 1943 from the U. S. Naval Academy, Norton saw service as a deck officer aboard destroyers in the Atlantic, and in damage control work on a cruiser in the Pacific. He later taught damage control at the Norfolk naval base. Before assuming his present connection he took sales engineering training, followed by two years of work as a field engineer for a West Coast pump firm.



SHAFT deflection is low at point of best efficiency—(Fig. 4)



IMPROPER pump choice may make deflection worse—Fig. 5.

if the type of pump driver permits this alternative.

Point D on Fig. 5 shows what might happen in this case. Here the capacity is increased to 40 gpm., with the operator bypassing all but the 10 gpm. output to the system. Under this condition, deflection may be only 0.001 in. But if the operator gets his 10 gpm. by throttling back to Point C, the deflection as we have seen will be 13 times as great. With only 0.001 in. deflection, leakage can be reduced considerably. This in turn will mean less flow of abrasives.

10 Reduce Impeller Overhang

Usually the dimensions of the bracket joining the pump casing to the bearing pedestal will make it impossible to reduce the impeller overhang, but the chance of doing so should be checked since the deflection will decrease as the cube of the overhang decrease. Since mechanical seals need much less overhang than pumps with packing glands, a change to mechanical seal design may help.

11 Investigate Possibility of Improving Packing

Metallic packings are generally not good for gritty or abrasive liquids. The tiny particles become imbedded in the surface of the metallic foils and act as cutting tools, scoring shafts and sleeves.

A soft packing, such as Durametallic B-77 or D-22, or equivalents of other manufacturers, is better. These are plastic packings which flow easily to a seat with a minimum of gland pressure. Also, with packing of this type the abrasive particles tend to work in, rather than to stick to the surface. B-77 is a semi-metallic plastic packing in which long asbestos fibers and lead shreds are evenly distributed. It is good to 500 F. For higher temperatures D-22 may be used. This material has aluminum shreds instead of lead.

12 Investigate Change to Mechanical Seals

Use of mechanical seals is a separate subject in itself and the author is preparing an article to discuss their use primarily in abrasive applications. (This article will appear in an early issue—EDITOR.) However, one or two aspects of their use should be mentioned here.

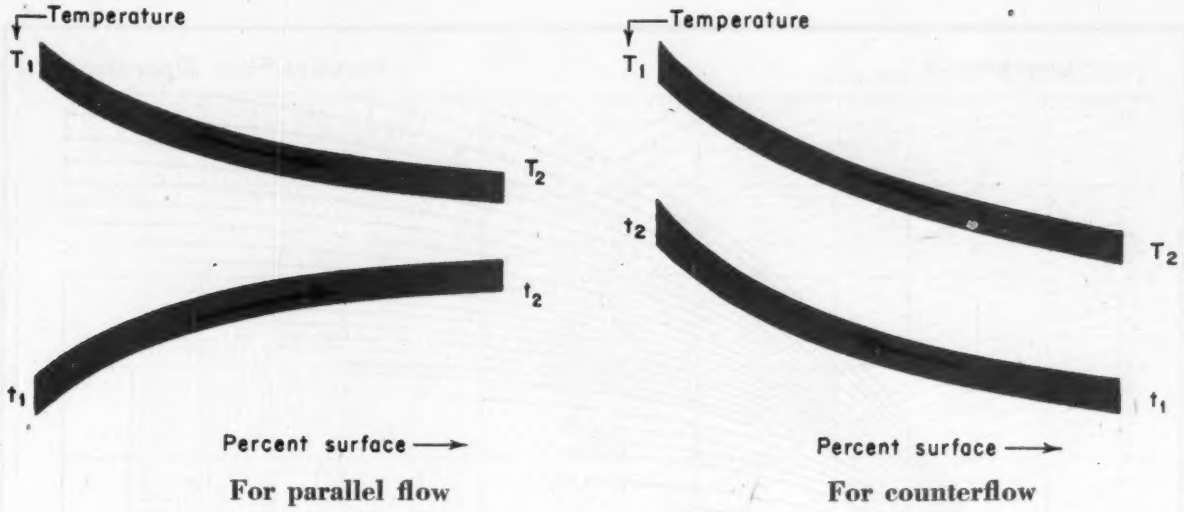
Mechanical seals will work quite satisfactorily in abrasive service if they can be flushed through with clear liquid, assuming the liquid pumped can stand the contamination. If contamination is not permissible, then a seal is generally flushed with the liquid being pumped, which brings abrasive into the seal, but at least keeps the particles in motion. Abrasive particles would make short work of ordinary materials used for the rubbing surfaces, such as the stationary and rotating mating faces. Therefore, extremely hard materials such as boron carbide are sometimes used for these running faces, but there are many limitations on their use.

Process industry users of pumps are often able to pipe a clear liquid into the mechanical seal under enough pressure to keep abrasives fairly well flushed out. This is particularly true in continuous process work. In batch processing it is much more difficult to prevent abrasives from contaminating the seal during shutdown.

13 Investigate Use of More Wear Resistant Materials

If none of the other methods we have been considering can be applied in any particular case, then we can often bring about some improvement in stuffing box performance by choosing more wear resistant materials for those parts of the pump which affect the packing. This applies principally to the shaft, or shaft sleeve. The interaction between the shaft (or sleeve), the abrasive particles, and the packing, is necessary for wear in the stuffing box. When the particles become imbedded in the packing they cut and score the shaft. The scored shaft then destroys the packing. If the shaft material is resistant enough to abrasion, the particles will no longer cut it seriously and it follows that the shaft can not then tear up the packing. Pump manufacturers and the foundries specializing on special hard alloys with low friction coefficients are likely sources of information to fit the particular case.

Haynes Stellite split sleeves can be used which have a Rockwell A scale hardness of about 79. These sleeves are furnished split and are welded on.



For parallel flow — For counterflow

You Can Now Use These Time-Saving . . .

Heat Transfer Performance Curves

To solve your heat exchanger design problems and to evaluate the efficiency of your present installations, use these curves instead of a trial-and-error method.

IRVING GRANET

One of the common problems that the chemical engineer faces in the design of process equipment is the sizing of convection heat transfer surfaces. If the fluid quantities and their properties are known, the over-all heat transfer coefficient can be calculated by available methods[a] for a given surface configuration.

Presented here are performance curves for heat transfer. They can be used to find the heating surface directly since it will be the only unknown. You can also predict from these curves what the effect of fouling of the convection surfaces will be on the performance of the unit. Conversely, you can find the amount of fouling, after an exchanger has been operated for a while, from the change in thermal efficiency.

All of this can be done without having to resort to a trial-and-error method of calculation.

THE BASIC EQUATIONS

One or both of the fluids exchanging heat as they pass through the apparatus undergoes simultaneous temperature changes from entrance to exit. A knowledge of the mean temperature difference between these fluids is necessary if you wish to calculate the heat given up by the hot fluid to the cold fluid.



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We know that the proper mean temperature difference for the cases of both counterflow and of parallel heat transfer is the logarithmic mean temperature difference.[1] For counterflow, we way write:

$$LMTD = \frac{(T_1 - t_2) - (T_2 - t_1)}{\ln [(T_1 - t_2)/(T_2 - t_1)]} \quad (1)$$

and for parallel flow the mean temperature difference is:

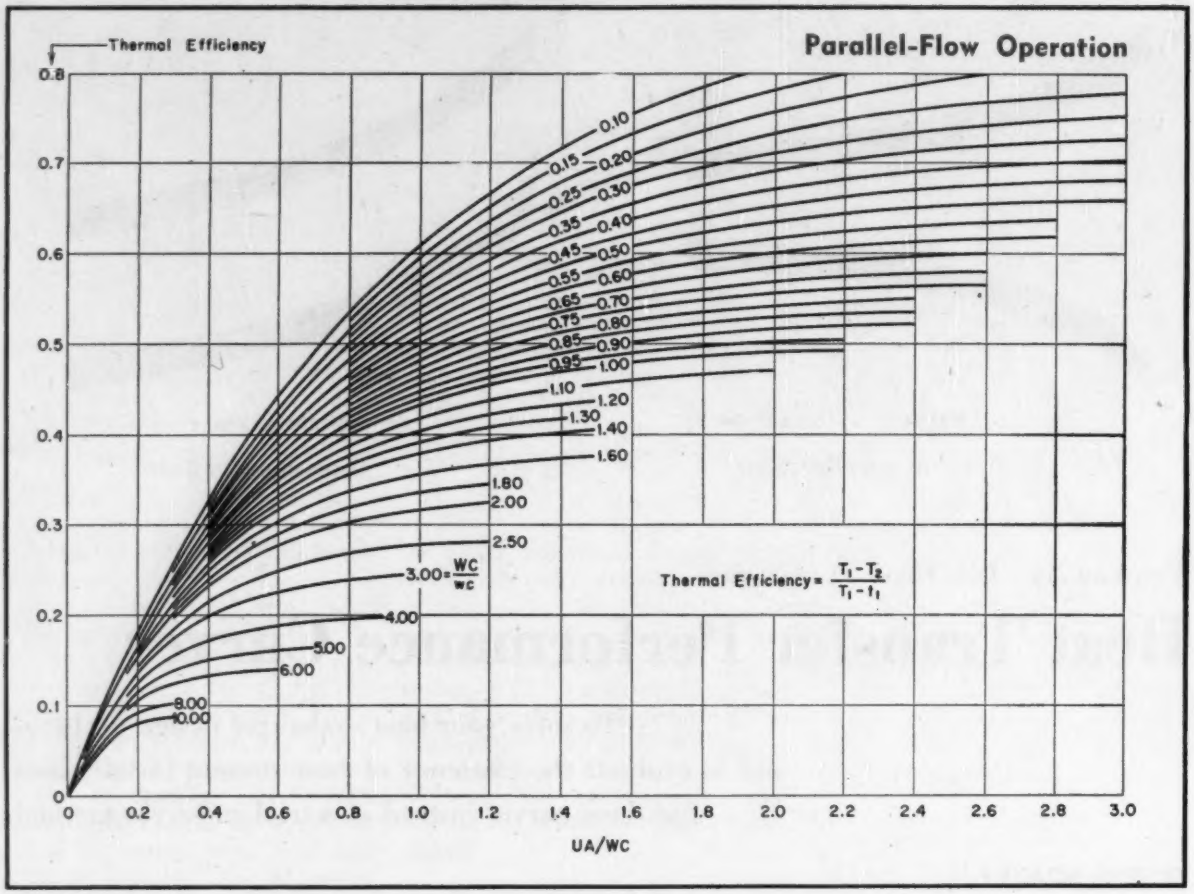
$$LMTD = \frac{(T_1 - t_1) - (T_2 - t_2)}{\ln [(T_1 - t_1)/(T_2 - t_2)]} \quad (1a)$$

The individual temperatures referred to in Eqs. (1) and (1a) can be represented best as shown in the sketches above.

To derive these expressions, we must make certain assumptions. They are given by Kern[1] as:

1. The over-all constant of heat transfer is constant over the entire length of the path.

2. The pounds per hour of fluid



flow is constant, obeying steady-state requirements.

3. The specific heat is constant over the entire length of path.

4. There are no partial phase changes in the system (such as vaporization or condensation). The derivation is applicable for sensible-heat changes and when vaporization or condensation is isothermal over the entire length of path.

5. Heat losses are negligible.

Using assumptions 1, 2, 3 and 5 we may write the steady state heat transfer equations for the case of parallel flow.

$$UA(LMTD) = (T_1 - T_2)WC = (t_2 - t_1)wc \qquad (2)$$

While Eqs. (1a) and (2) provide the necessary information for parallel flow, they are not the most convenient forms for most problems. Combining these equations we obtain:

$$(T_1 - T_2)\frac{WC}{UA} = \frac{(T_1 - t_1) - (T_2 - t_2)}{\ln[(T_1 - t_1)/(T_2 - t_2)]} \qquad (3)$$

Note that wc/WC is equal to $(T_1 - T_2)$ divided by $(t_2 - t_1)$. We can transpose Eq. (3) and simplify.

$$\frac{UA}{WC}\left(1 + \frac{WC}{wc}\right) = \ln\frac{(T_1 - t_1)}{(T_2 - t_2)} \qquad (4)$$

Now, we'll express Eq. (4) in terms of exponentials and subtract 1 from each side.

$$e^{(UA/WC)[1+(WC/wc)]} - 1 = \frac{(T_1 - t_1)}{(T_2 - t_2)} - 1 \qquad (5)$$

and by simplifying Eq. (5),

$$\frac{e^{(UA/WC)[1+(WC/wc)]} - 1}{1 + (WC/wc)} = \frac{(T_1 - T_2)}{(T_2 - t_2)} \qquad (6)$$

If we invert Eq. (6) and add 1 to each side of the equation, we get:

$$\frac{1 + (WC/wc)}{e^{(UA/WC)[1-(WC/wc)]} - 1} + 1 = [T_2 - t_2)/(T_1 - T_2] + 1 \qquad (7)$$

Then we rearrange Eq. (7) and divide numerator and denominator by e raised to its exponent.

$$\frac{1 - e^{-(UA/WC)[1+(WC/wc)]}}{1 + (WC/wc)e^{-(UA/WC)[1+(WC/wc)]}} = \frac{1}{1/[(T_1 - T_2)/(T_1 - t_1)] - (WC/wc)} \qquad (8)$$

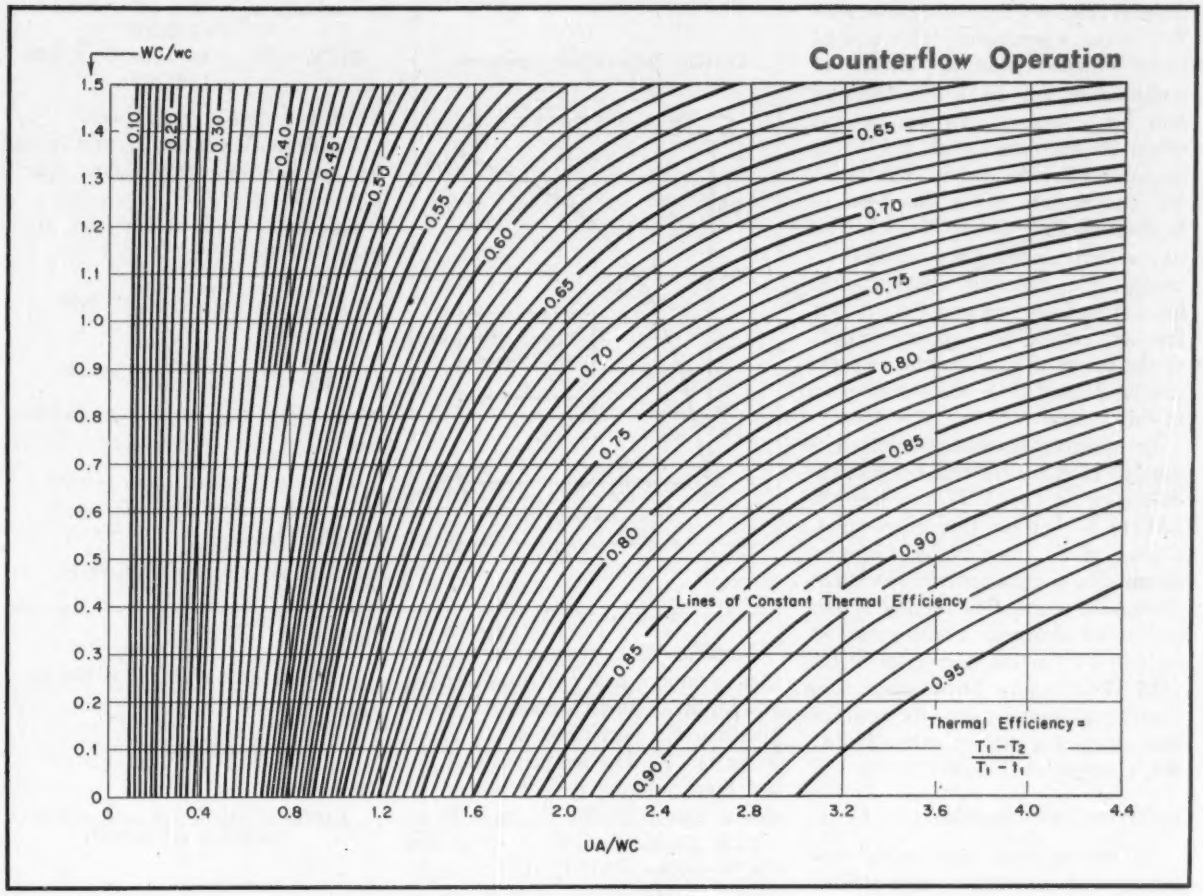
THE THERMAL EFFICIENCY

In Eq. (8) the ratio $T_1 - T_2/T_1 - t_1$ is of particular significance. This ratio shows the relation between the actual temperature drop in an exchanger to the theoretical maximum temperature drop in an exchanger with an infinite amount of surface.

We have called this ratio the "thermal efficiency" of a heat exchanger for obvious reasons. Solving Eq. (8) for the thermal efficiency we obtain the final desired equation between the variables involved in terms of several dimensionless groups:

$$\frac{T_1 - T_2}{T_1 - t_1} = \frac{1 - e^{-(UA/WC)[1+(WC/wc)]}}{1 + (WC/wc)} \qquad (9)$$

From an inspection of Eq. (9) it is evident that a problem in parallel heat



flow transfer can be uniquely solved by a knowledge of the dimensionless groups given in this equation.

The derivation of the thermal efficiency for counterflow operation starting with Eqs. (1) and (2) is similar to the parallel flow derivation given above. Thus we are able to arrive at Eq. (10) which expresses the thermal efficiency in counterflow as a function of the same dimensionless ratios as in parallel flow:

$$\frac{T_1-T_2}{T_1-t_1} = \frac{1-e^{-(UA/WC)[1-(WC/wc)]}}{1-(WC/wc)e^{-(UA/WC)[1-(WC/wc)]}} \quad (10)$$

There is another case which has commercial importance. This is the case where one of the fluids is being heated isothermally as in the convection section of a boiler. We may write the thermal efficiency for this case from either Eqs. (9) or (10) as both will reduce to the same result in the limit.

$$\frac{T_1-T_2}{T_1-t} = 1-e^{-(UA/WC)} \quad (11)$$

In these derivations we have followed (generally) the notation of Sengstaken.[8] As indicated in Sengstaken's paper, (Eqs. (9), (10) and (11) can be plotted as unique functions of the three dimensionless ratios. Such plots appear above and on the following page.

Nomenclature

A	Area of heat transfer surface, sq. ft.
c	Specific heat at constant pressure of cold fluid, Btu./lb.-°F.
C	Specific heat at constant pressure of hot fluid, Btu./lb.-°F.
e	2.7183
F_t	Logarithmic mean temperature difference correction factor for multipass arrangements.
$LMTD$	Logarithmic mean temperature difference, °F.
t	Temperature of cold fluid, °F.
T	Temperature of hot fluid, °F.
U	Over-all heat transfer coefficient based on outside surface, Btu./hr.-°F.-sq. ft.
w	Flow rate of cold fluid, lb./hr.
W	Flow rate of hot fluid, lb./hr.
Additional subscripts	
1	Refers to entering conditions
2	Refers to exit conditions

PERFORMANCE CURVES

If the fluid quantities and their characteristics are known, the over-all heat transfer coefficient can be calculated by available methods[8] for a given configuration of surface. From the curves the heating surface can be determined since it will be the only unknown.

It is also possible to predict from the curves what the effect of fouling of the convection surface will be on the performance of a unit; conversely, the amount of fouling can be determined, after a unit has operated for a length of time, from the change in thermal efficiency.

All of this can be done without having to resort to a trial-and-error method of calculation.

Sengstaken has plotted the thermal efficiency for parallel flow against the

thermal efficiency for counterflow with WC/wc as a parameter. This type of curve indicates what the change of performance will be if the types of flow are changed from one to the other. He has also plotted (UA/WC) for parallel flow divided by (UA/WC) for counterflow as a function of thermal efficiency and (WC/wc). This second curve shows, for equal heat exchange, the difference between the heating surfaces required for counterflow and parallel-flow operation. Both of the curves in the Sengstaken paper can be derived from the curves given in this article.

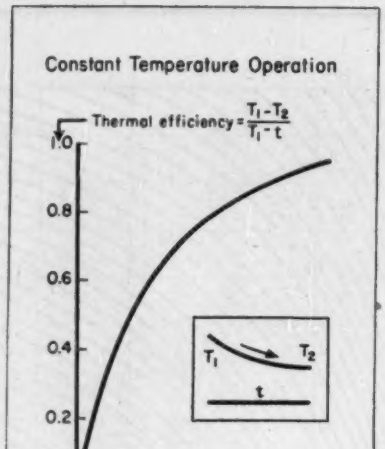
In multipass heat exchangers it is possible to define the true temperature difference as $F_t(LMTD)$ where the $LMTD$ is that for true counterflow. Curves of F_t are available for most commercial arrangements.[6,7] The charts plotted for counterflow become applicable to all multipass arrangements by including F_t in the numerator of the (UA/WC) term. Thus when using a multipass arrangement, the counterflow charts are entered with (F_tUA/WC) instead of (UA/WC).

RADIATIVE HEAT TRANSFER

So far we have been solely concerned with convection heat transfer as is usually found in industrial installations. In many cases it is very difficult to separate the convective and radiative heat transfer as it occurs in these installations. In those cases where all or nearly all of the heat transfer is due to radiation (as in the case of a direct-fired furnace) the curves that are presented in this article do not apply.

However, where the heat transfer is due to both radiation and convection (as is the case in the high-temperature convection zones of furnaces) it is entirely proper to combine the equivalent heat transfer coefficient due to radiation with the convection coefficient to obtain the over-all coefficient of heat transfer to be used with the appropriate curves of this article.

Note also that where the radiative heat transfer is due to luminous radiation, as is found in a furnace,[4] the procedure given above does not apply. For the calculation of non-luminous heat transfer in the tube banks of oil-fired units the method given in reference 5 is convenient and easily applied.



HOW TO USE CHARTS

Problem—For counterflow operation, assume a heat exchanger having 500 sq.-ft. of surface and an over-all heat transfer coefficient of 10 Btu./hr.-sq.-ft.-° F. The temperature of the hot fluid entering is 750 F. and its weight flow is 24,000 lb./hr. with an average specific heat of 0.24. The cold fluid entering is 200 F. and its weight flow is 10,000 lb./hr. with a specific heat of 1.2. Determine the temperature of each fluid leaving this counterflow unit.

Solution—First we'll solve for the WC/wc ratio.

$$\frac{WC}{wc} = \frac{24{,}000 \times 0.24}{10{,}000 \times 1.2} = 0.48$$

Then,

$$\frac{UA}{WC} = \frac{10 \times 500}{24{,}000 \times 1.2} = 0.868$$

From the proper performance curve, the thermal efficiency is approximately equal to 0.525. Therefore,

$$(750 - T_2)/(750 - 200) = 0.525$$

$$T_2 = 461 \text{ F.}$$

By a heat balance:

$$\frac{289 \times 24{,}000 \times 0.24}{1.2 \times 10{,}000} = 138.7° \text{ F.}$$

This then is the rise in temperature of the cold fluid. Therefore

$$t_2 = 338.7 \text{ F.}$$

As a check we can calculate $LMTD$:

$$LMTD = 150.3/\ln (411.3/261)$$
$$= 330.4$$

$$UA(LMTD) = 10 \times 500 \times 330.4$$
$$= 1{,}652{,}000$$
$$WC(T_1 - T_2) = 289 \times 24{,}000 \times 0.24$$
$$= 1{,}664{,}600$$

which is a close enough check.

Problem—Work out the same problem as above for parallel-flow operation.

Solution—We'll follow the same procedure as above.

$$\frac{WC}{wc} = \frac{24{,}000 \times 0.24}{10{,}000 \times 1.2} = 0.48$$

$$\frac{UA}{WC} = \frac{10 \times 500}{24{,}000 \times 0.24} = 0.868$$

Now, from the proper parallel-flow curve, the thermal efficiency is 0.489.

$$(750 - T_2)/(750 - 200) = 0.489$$
$$T_2 = 481 \text{ F.}$$

By a heat balance:

$$269 \times 24{,}000 \times 0.24 = 1{,}550{,}000 \text{ Btu./hr.}$$

The rise in temperature of the cold fluid is:

$$1{,}550{,}000/(1.2 \times 10{,}000) = 129° \text{ F.}$$

Therefore,

$$t_2 = 329 \text{ F.}$$

As a check,

$$LMTD = 398/\ln (550/152) = 310°$$
$$310 \times 500 = 1{,}550{,}000$$

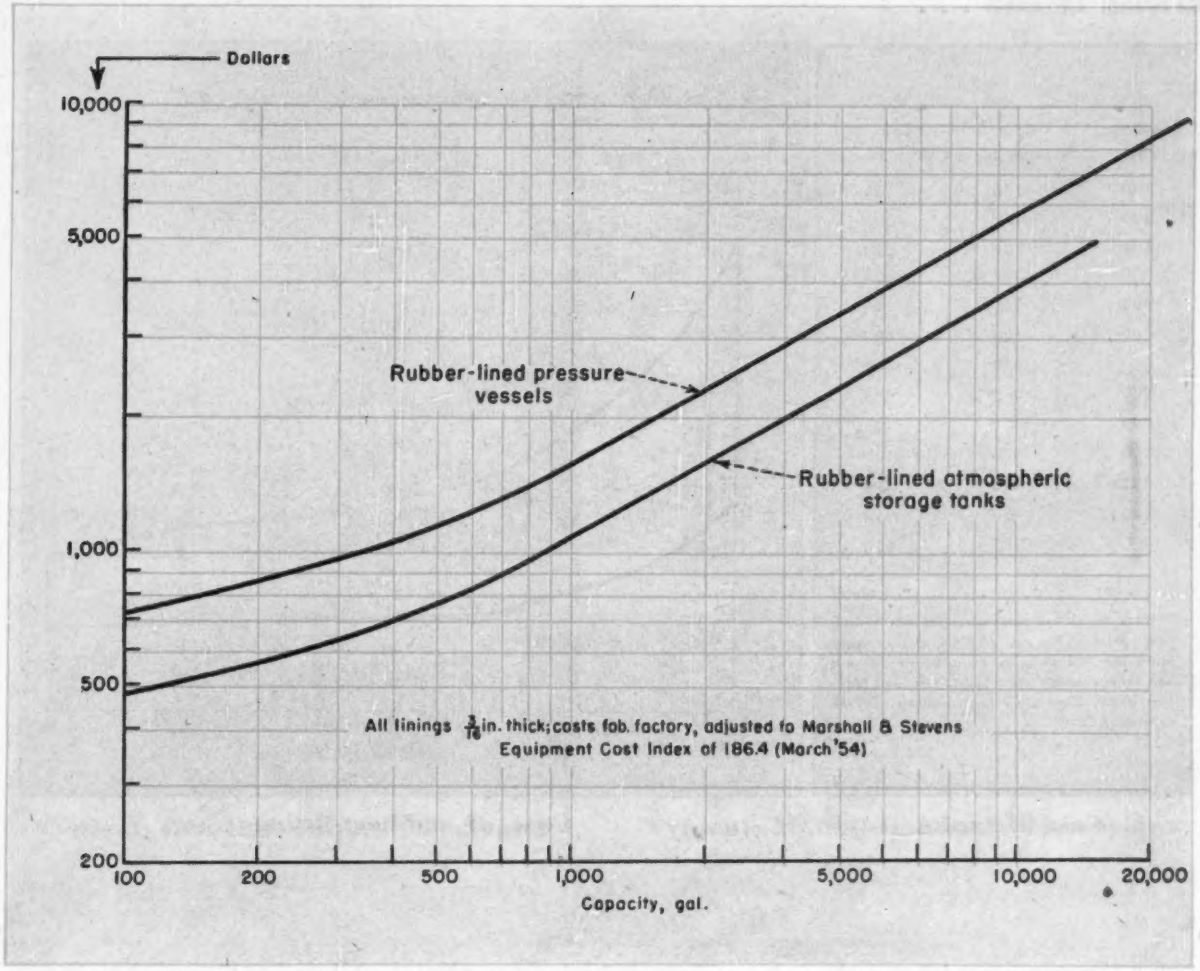
QUITE A TIME SAVER

Without the performance curves, in either of the cases above, a solution can only be obtained by a direct solution of the equations, successive approximations or a graphical method. The work is simplified tremendously when these curves are used.

The saving in labor for multipass arrangements is even greater though it may be necessary to repeat the above procedure more than once to get the desired solution. The process converges very quickly, though.

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How Much for Rubber-Lined Vessels?

Here are cost curves to help you in preparing job estimates on projects requiring rubber-lined tanks and pressure vessels. The data cover a wide range of sizes and shapes.

R. W. LUNDEEN and W. G. CLARK

Rubber-lined storage tanks and pressure vessels are widely used in the chemical industries. Available data on installed tank costs[1, 2] are most useful for preliminary estimates of large jobs, where the cost of rubber-lined apparatus is a relatively small part of the total.

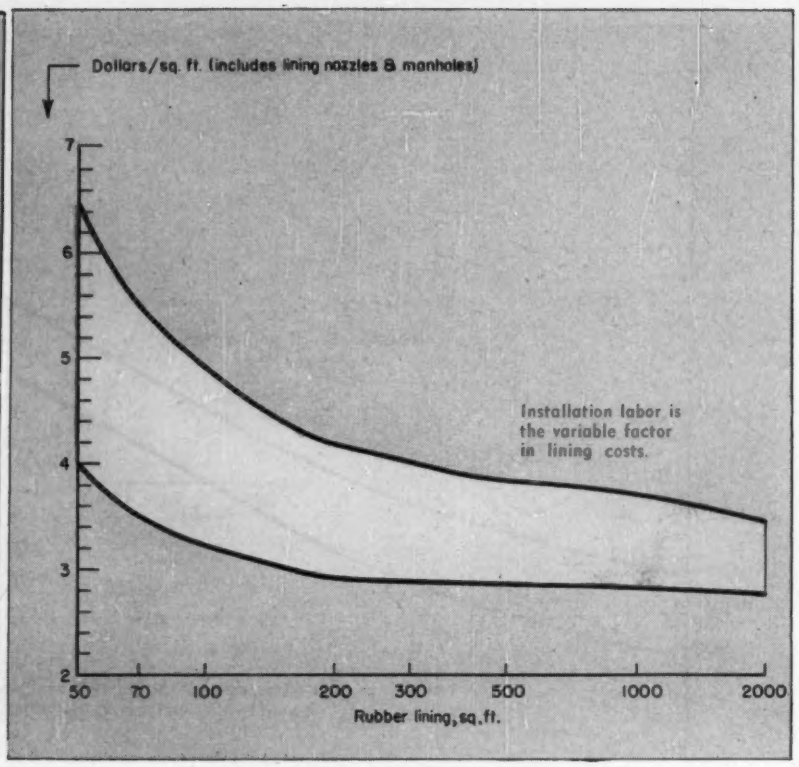
In those cases, the principle of "compensating errors" has opportunity to work on the variable installation costs. On the smaller job—which may consist only of installing one or two rubber-lined tanks, several pumps and connecting piping—we find that available data on installed tank costs are inadequate. The data of Coe[3] on bare tank costs are useful but are limited to smaller tanks.

On small projects, particularly additions to existing facilities, the conditions of installation can vary widely. For this reason, we feel that bare equipment cost is a better starting point for the estimates in such situations. After obtaining the delivered costs of the major equipment items, a separate and reasonably detailed estimate of labor and material required for installation should be made. If

Capacity, gal.	Cost, $ Without Jacket	Cost, $ With Jacket
200	110	160
300	180	205
400	200	275
500	235	300
600	285	345
700	300	390
800	320	410
900	380	455
1000	390	490
1100	400	510
1200	420	550
1300	450	590
1400	485	610

These values are taken from the Coe article, Sept. 1948, on the cost of plain steel flat-head tanks. The data are based on tanks with diameter and height nearly equal, and 1/4-in. wall thickness. Prices given are those prevailing in 1948 at Niagara Falls.

Cost of tanks



Cost of rubber linings

such a procedure is not followed, the percentage error in the estimate can be high.

Cost of Rubber-Lined Tanks

To assist in the preparation of these smaller job estimates, when time is not available to get quotations, we've prepared the cost curves for rubber-lined tanks and vessels. The basis for the curves was an analysis of the fob. factory costs of 51 different rubber-lined atmospheric storage tanks and pressure vessels purchased in two divisions of the Dow Chemical Co. during the past eight years. The rubber lining was done by at least six different companies. The tanks and vessels were fabricated in both California and the Midwest. All costs were for shop-fabricated items. No field-erected tanks were considered. Most of the individual item costs were within ±10% of the values shown on the cost curves.

However, if the vessels were complex in shape, had unusual numbers of external nozzles and openings, or had internal rubber-lined baffles, support rings or other such fittings, the costs were substantially higher than shown.

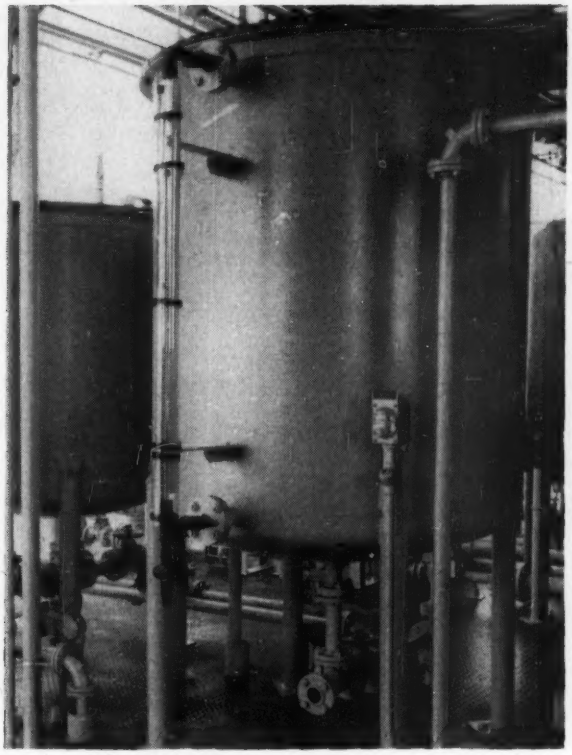
A typical rubber-lined pressure vessel would have: 10,000 gal. capacity, 8 ft. dia., 28 ft. length, 50 psig. design pressure. The pressure vessels considered were designed in accordance with the ASME Code for Unfired Pressure Vessels. Design pressures ranged from a low of 20 psig. for some 1,100-gal. vessels to a high of 160 psig. for a 650-gal. vessel. The largest units for which data were available were 21,000 gal. capacity, 10 ft. dia. by 36 ft. long, designed for 75 psig.

For certain types of rubber lining, it's desirable to use pressure vulcanization. In such cases, it may be necessary to design the vessel for pressure service just to withstand the vulcanizing process, even though the operating conditions do not require the pressure design.

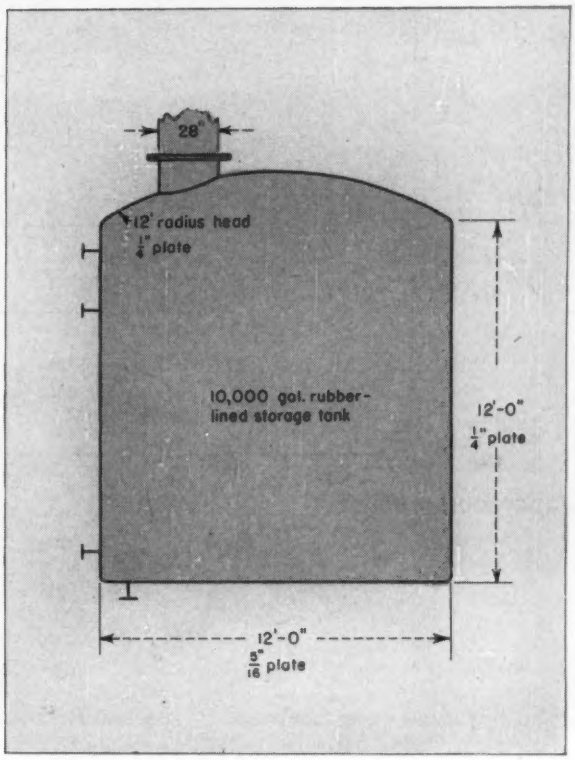
A typical small atmospheric storage tank has 640 gal. capacity, is 54 in. dia. by 60 in. on the straight side; has five 2 in. nozzles, flanged and dished



R. W. LUNDEEN, Process Engineer in the Engineering Dept. of Dow Chemical's Western Division at Pittsburg, Calif., is a native of Oregon. He graduated from Oregon State College in 1942, and spent three years in the Air Corps. He joined Dow in 1946. In the Engineering Department, he is now doing process design and project supervision.



Typical: 600-Gal. rubber lined tank



Typical: 10,000-Gal. tank dimensions

bottom, open top and plywood cover. The larger atmospheric storage tanks for which data were available are similar to the sketch of the 10,000 gallon rubber-lined tank shown in the drawing above.



W. G. CLARK is employed in Dow's Western Division Engineering Dept., in charge of cost data collection and estimating. A native of New Jersey, he worked for Wright Aeronautical and the Army Medical Corps, before joining Dow eight years ago. For the last year he's concentrated on developing engineering standards, cost estimating and collection methods.

Lining Costs Can Vary

In rubber lining tanks and vessels, the major cost is the labor of applying the lining. When a large amount of cutting and fitting is required; when the working space is cramped or when scaffolding or ladders must be used to reach the work; the cost per square foot or rubber lining increases. A considerable amount of information which we had available for the costs of rubber lining alone is shown in the graph in the form of cost range curves.

In general, we found that small vessels with open tops and of sufficient diameter to allow good access to the interior were in the low cost range. Small vessels which had only manholes for access or afforded only limited internal working space were in the high cost range.

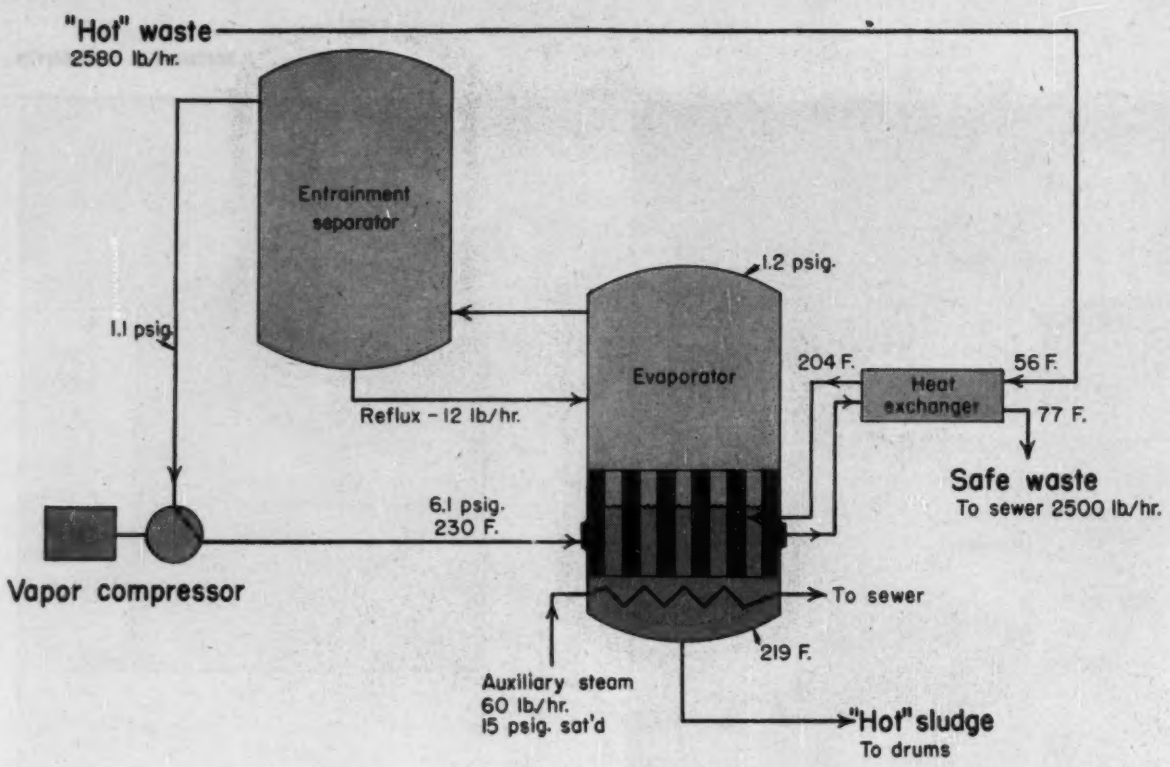
Large tanks, (20 ft. dia. by 20 ft. high field-erected units) in which scaffolding had to be used to reach the upper work surfaces, were in the high cost range. Large pressure vessels, (10 ft. dia. by 36 ft. long units) which could be rotated to make the interior work surfaces accessible, were in the lower cost range.

In any use of this kind of data, full consideration must be given to the conditions under which the lining work will be done.

The writers wish to acknowledge the Dow Chemical Co.'s kind permission to publish the data in this article. They want to thank Mr. K. R. Robertson of Dow's Midland Division Engineering Department for the very substantial amount of information which he supplied us.

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Vapor Compression Evaporation

A hundred-fold reduction in volume of radioactive wastes eases a hazardous—and expensive—storage problem.

BERNARD MANOWITZ, POWELL RICHARDS and ROBERT HORRIGAN

Vapor compression's first crack at evaporation of atomic wastes is faring quite well. Its sponsor—Brookhaven National Laboratory, Upton, N. Y.—has been using the technique for more than a year and a half to handle at low cost all liquid radioactive wastes at BNL.

Brookhaven, like every other Atomic Energy Commission installation, was finding disposal of radioactive wastes a knotty problem. Permanently safe storage of its steadily produced liquid wastes would constitute an expensive item with tankage costing 20¢ and more a gallon (see chart). Thus prompted, Brookhaven put five years of research and development work into methods of concentrating and disposing this waste, came up with the present vapor compression process. Based on experience gained in the pilot plant, a full-scale unit (300 gph.) started up in July 1953.*

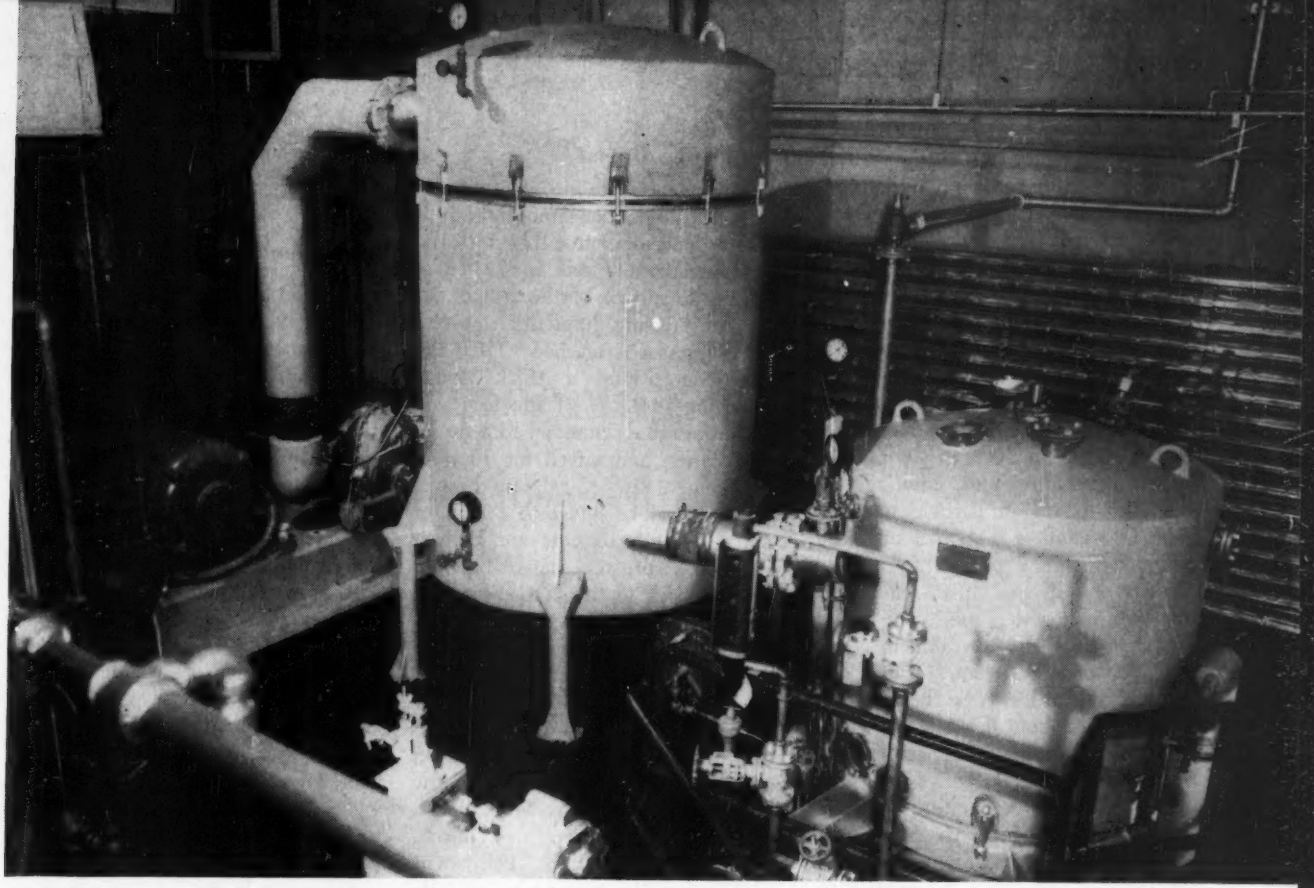
Heat economy equivalent to a 27-effect conventional steam-heated multiple effect evaporator system has been claimed for mechanical vapor recompression. Brookhaven's record—15 to 16 lb. of distillate per 1,000 Btu. input—checks pretty well. And the overall picture at BNL points up how cheap electric power, a tight supply of steam and cooling water, and liquor with a low solids content—and little boiling point rise with concentration—can combine to create a favorable setting for vapor recompression to exert its great energy-saving potential.

* Designed and fabricated by Cleaver-Brooks Co., Milwaukee, Wis., and installed under the supervision of Sanderson and Porter Engineering Co. of N. Y.

Plant Performance

During the first six months of full scale operation the recompression unit at Brookhaven worked five days a week, seven hours a day, at the design rate of 300 gph. Approximately 234,000 gal. of feed was concentrated to 3,040 gal. of sludge (1.3% of original volume). About 117 55-gal. drums were required to dispose of the sludge permanently.

In a typical 22-hr. run, 6,700 gal. of feed were concentrated to 80 gal. of sludge. Expenditure of energy at the start (heat transfer coefficient of 495) was 27 kw. (92,300 Btu./hr.) to the steam compressor motor and 58,380 Btu./hr. to auxiliary steam. At the end of the run (heat transfer coefficient of 421), the compressor was drawing 33 kw. (112,200 Btu./hr.) and



Handles Radioactive Waste Disposal

auxiliary steam demand was about the same as before.

This all adds up to 16.5 lb. of distillate produced per 1,000 Btu. input at the start of the run and decreasing to 14.6 at the end. (A quintuple effect evaporator yields only about 3.6 lb. of distillate per 1,000 Btu. input.)

With decontamination factors (feed radioactivity concentration/distillate radioactivity concentration) exceeding 10^8 so far, better than 99.999% of the radioactivity in the feed is retained in the sludge and permanently disposed of.

Safety First

A high decontamination efficiency is vital to Brookhaven's process; it means the main waste stream, in this case distillate, is nearly completely deactivated. And it must be, for in any operation releasing radioactivity to the environment, the AEC puts safety above all other considerations.

In the case of the liquid stream leaving the BNL site, Brookhaven proposed, and the AEC agreed, that the activity concentration must not exceed 3×10^{-12} total curies/ml. (α, β and γ, 90 days average). Since an activity concentration as high as 3×10^{-7} curies/ml. was possible, a concentration process with an over-all decontamination factor of at least 10^6 was necessary. Research showed that a simple evaporation step gave D.F.'s on the order of 10^4-10^5 and that de-entrainment of the vapor stream with fiberglass filters yielded over-all D.F.'s of 10^6-10^7.

Process Rundown

The great bulk of the waste to be concentrated at Brookhaven—a dilute solution of radioactive salts (sp. gr. of 1.01 or less)—is stored in three 100,000-gal. specially coated mild steel tanks. All remaining tanks, piping and concentration equipment are of stainless steel.

Waste is pumped from storage vessels to either of two 5,000-gal. cone-bottom tanks where it is blended by pump recirculation with smaller amounts of "hotter" material siphoned off slowly from six 8,000-gal. underground storage tanks.

Additions of caustic or acid made to the blending tank batches keeps the pH close to 7, to suppress foaming in the evaporator.*

Blended feed is pumped at 310 gpm. first through a duplex strainer, then through the inner pipes of a double pipe heat exchanger (designed for easy cleaning), where it is heated to 200 F. by outgoing condensate, and finally into the evaporator body.

Fiberglass Pickup

In the still pot, below the lower tube sheet of the vertical evaporator calandria, is an auxiliary steam coil which starts the process and continues

* Other foam preventives: adding antifoam agent to cold feed for the evaporator; lowering evaporator's liquid level; reducing speed of steam compressor.

to supply lesser amounts of heat throughout the run. The calandria, constructed of Type 316 ELC stainless steel, contains 894 tubes, $\frac{7}{8}$-in. O.D. x 16 gage, welded to $\frac{3}{4}$-in. tube sheets.

As stillpot liquor boils inside the calandria tubes, steam passes around a baffle, located just above the top tube sheet, which deflects spray downward. Steam moves out of the evaporator, through an 8-in. duct, to the bottom of the vapor filter unit, entering tangentially to aid in particle removal. The filter unit—a 3-ft. bed of 14-20 micron fiberglass packed to a bulk density of 5 lb. per cu. ft.—effectively removes radioactive solid and liquid material from the low velocity (one foot per second) stream.

Normal heat loss from the fiberglass bed provides about 0.5% reflux which continually washes the bed free of trapped activity as it drains back to the feed side of the evaporator.

De-entrained steam passes through an axial flow steam compressor—which operates up to a 9 psi. differential—to the shell side of the evaporator calandria where it condenses to supply nearly all the heat for boiling evaporator feed. Condensate flow preheats cold feed in the heat exchanger and discharges to the sewer after being monotored for residual activity.

Radioactive Burial

Thick concentrate in the evaporator is not discharged continuously, but is allowed to accumulate either until the limit on radiation level is reached at the outside surface of the stillpot, or until the pressure differential limit of the compressor is reached. Then the waste concentrate, a thick sludge amounting to 1-2% of the feed volume processed, is pumped to a drumming station and mixed for 30 min. with cement in 55-gal. mild steel drums (25 gal. of sludge to 384 lb. of cement). The contents are allowed to harden 24 hr., supernatant liquor is siphoned back to the evaporator feed and the drums, which now read 300 milliRankin per hour or more,* are finally sealed and sent to sea burial.

Feed handled in the evaporator leaves scale in the calandria tubes during a run, resulting in the heat transfer coefficient of 15% reported for the typical 22-hr. operation. Most of this scale is flushed off when thick concentrate is pumped to drums. Permanent scale, once a serious problem, is pretty well controlled now by addition of conventional water softeners to the feed. In the last 600 hr. of processing no appreciable reduction in heat transfer coefficients has been noted.

* Recent improvements in handling hot material at Brookhaven permit higher activity levels in evaporator and drums. Drummed material often reads 1,000 milliRankins per hour now before sealing and burial.

Instrumentation

Bourdon gages measure pressures of auxiliary steam; feed; thick liquor; distillate; vapor at evaporator head, in the steam chest, and at the outlet and inlet of the vapor filter. Temperatures of feed and distillate entering and leaving the heat exchanger, of compressed vapor, auxiliary steam condensate, thick liquor and compressor bearings are measured with iron-constantan thermocouples and recorded.

Rotameters indicate feed and distillate flow rates. Pressure in the evaporator head automatically regulates auxiliary steam flow. Manual control of feed rate regulates evaporator liquid level; high liquid or foam level actuates a cutoff which shuts down feed pump and compressor.

Big Savings at Small Cost

First costs of Brookhaven's evaporation unit, include $267,000, $60,000 for the evaporator, vapor filter, and related equipment; $44,000 for piping, valves and instrumentation; $50,000 for design and field engineering; and $113,000 for building and installation of equipment. Monthly out-of-pocket expense comes to $1,100 and includes labor, supervision, utilities, and drums.

Savings on storage are big, though: $93,000 a yr. This figure is based on the cost—20¢ a gal.—of storing 468,000 gal. of liquid wastes yearly if they had not been reduced to one percent of their volume by evaporation.

Actually that savings figure doesn't tell the whole story because it's based on temporary, above-ground storage of hot wastes. Permanent, monitored storage underground might cost $1.50 a gal. and more.







BERNARD MANOWITZ, a project engineer for Brookhaven's Fission Products Utilization Project, joined the laboratory in 1947 with a B.S. in Ch. E. (1943) from Newark College of Engineering, an M.S. in Ch. E. (1947) from Columbia. Research, design and liaison work in waste treatment led to his present position.

POWELL RICHARDS, associated head of the Hot Laboratory Operations Div. at Brookhaven, majored in chemistry at the University of North Carolina. He spent seven years with Du Pont in pigments, explosives and atomic energy work (Oak Ridge, Hanford) before coming to Brookhaven in 1948.

ROBERT HORRIGAN, a research investigator for National Lead at Niagara Falls, N. Y, and consultant in the Nuclear Engineering Dept. at Brookhaven since 1952, has three chemical enginering degrees: a Ph. D. from Yale (1951), an M.S. and B.S. from M.I.T. (1947, 1944).

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Chemical Engineering Fundamentals

Catalytic Vapor Phase Reactions—III

THOMAS E. CORRIGAN, Research Engineer, Olin Mathieson Chemical Corp., Brandenburg, Ky.

Last month (*Chem. Eng.*, Feb. 1955, p. 195), we presented the assumptions upon which the rate equations are based and discussed the logic of each. This month we'll discuss how kinetic data are expressed and how they are obtained.

Empirical Equations in Catalysis

In many cases kinetic data are expressed by the use of rate equations that are entirely empirical. These equations often represent the data satisfactorily over the range of the experiments. There is no reason to condemn an equation merely because it is empirical. If the equation can be used with reliability for reactor design, it is a satisfactory expression of the reaction behavior.

As a matter of fact, until the basic assumptions of the mechanism equations presented in this series are thoroughly confirmed by experimental data, they too may be regarded as a set of empirical equations (a highly systematized set with very logical justification, though).

In the meantime, other empirical equations can also be used which may be simpler to apply or may contain fewer arbitrary constants. These also have their merit and are thoroughly justified.

Use of a "Dirt Factor"

In many reactions there is a continual deposit upon the surface of the catalyst which reduces its effectiveness. Even at a constant flow rate the conversion in a flow reactor may continue to decrease during a run. When the catalyst activity drops to a certain point it is removed and regenerated.

We can account for this decrease in catalyst activity with time by adding an empirical term to the rate equation. This term could be added as a coefficient of the numerator. A more logical place to add this term might be in the denominator as an added term to the series of adsorption terms.

It may be assumed that a deposit on the catalyst will decrease the total number of active centers. Thus,

$$L = c_l + c_A + \cdots + D$$

and

$$c_l = (L - D)/(1 + K_A p_A + \cdots)$$

where D is the fouling factor. With this correction the rate equation would be:

$$r = \frac{k_2[L - D][p_A - (p_R p_S/K)]}{(1 + K_A p_A + K_R p_R + K_S p_S)} \qquad (1)$$

Hougen and Watson[4] suggest adding this fouling term to the denominator. Thus,

$$r = \frac{k[p_A - (p_R p_S/K)]}{(1 + K_A p_A + K_R p_R + K_S p_S + D)} \qquad (2)$$

In both cases D is not a constant. It varies with pressure, total conversion and length of run.

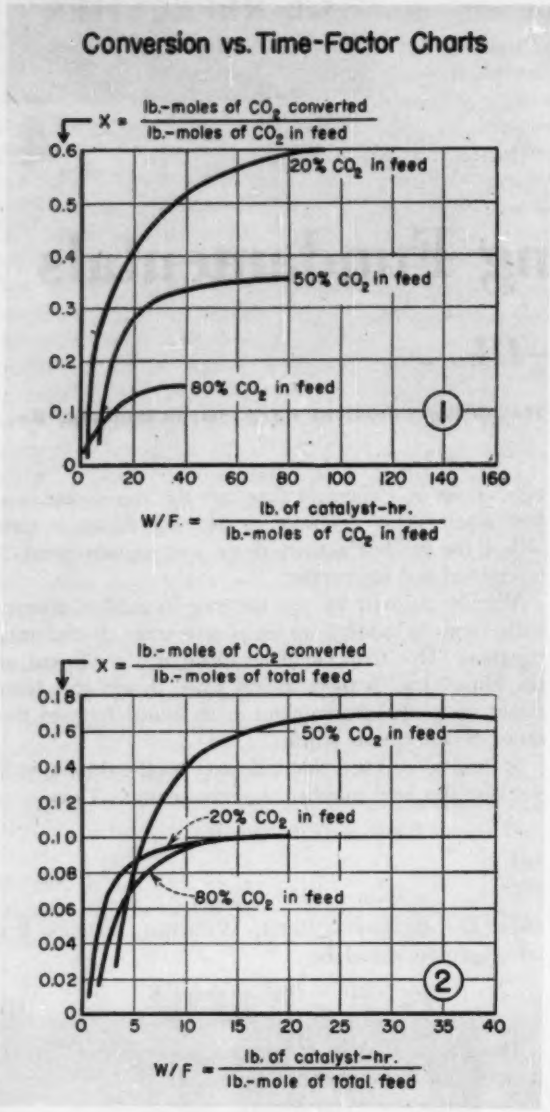
Catalyst Poisoning

A material which vitiates the value of the catalyst is a poison. A foreign material in the gas stream may either combine permanently with the active centers or merely block the pore openings and hinder diffusion into the catalyst. When the value of L becomes zero, the catalyst ceases to function and is said to be "poisoned." A reaction may be self-poisoning if the adsorption of the products is so great that most of the active centers become occupied by product molecules.

There would then be no room for further adsorption of reactant molecules and the reaction would cease. The extreme of this case is where the reactant is dissociated upon adsorption but there is no desorption at all of product molecules.

Nomenclature (Consistent units)

A	Reactant
c	Concentration of adsorbed gas
d	Differential operator
D	Fouling factor
F	Feed rate, see p. 198
k	Rate constant, forward reaction
K	Equilibrium constant
l	An active center
L	Total effective concentration of active centers
p	Equilibrium partial pressure of adsorbent gas
r	Reaction rate
R, S	Products
W	Mass of catalyst
x	Degree of conversion



In that case the process is merely one of adsorption and the "catalyst" is not called a catalyst. It is an adsorbent.

How to Express Catalytic Kinetic Data

Before the kinetics of any reaction can be determined, experimental data must be obtained. These data must be expressed and interpreted properly before the correct rate equation and mechanism can be established for the reaction.

In a batch reactor the variables which can be independently set are temperature, pressure, feed composition and contact time. The dependent variable is degree of conversion. In a flow reactor the contact time does not appear as a variable but flow rate appears in its place.

The relationship between flow rate and contact time is very complicated and it is virtually impossible to calculate contact time from flow rate. However, kinetic data for catalysis are more easily obtained in a flow reactor and the ultimate use of the rate equation will also be for flow-reactor calculations.

For this reason the contact time is not used at all but a "time factor" is used. The time factor is the ratio of catalyst mass to feed rate, W/F. W is simply pounds of catalyst and F is lb.-moles of feed per unit time. F could also be lb.-moles of a specific reactant in the feed per unit time. Once F is defined in a given problem it must be consistent.

The basic equation for catalytic flow reactors is:

$$rdW = Fdx \tag{3}$$

where r = reaction rate; W = mass of catalyst; F = feed rate as explained above; and x = degree of conversion.

Eq. 3 can also be written

$$r\,d(W/F) = dx$$
$$r = dx/d(W/F) \tag{4}$$

This may also be expressed as Fdx/dW and has units of lb.-moles of feed converted per lb. of catalyst per hr.

The weight of catalyst needed for a specified feed rate and conversion can then be calculated by rearranging Eq. (4) this way:

$$\frac{W}{F} = \int_0^x \frac{dx}{r} \tag{5}$$

where W/F becomes the mass of catalyst needed per unit feed rate (usually expressed in moles of feed per unit time).

This ratio, W/F, is then the independent variable (for catalytic-flow reactors) which is used in place of contact time. The term contact time is thus dispensed with for flow reactors. The r term in Eq. (5) is the reaction rate and is expressed by equations developed in the previous section (*Chem Eng.*, Feb. 1955, p. 195).

Integral Reactor Data

There are two methods of expressing reaction data: total conversion data and differential or rate data. Total conversion data are usually expressed in the form of a plot of conversion vs. the time factor, W/F. These curves may be shown with total pressure, feed composition or temperature as the parameter (see Figs. 1 and 2).

Since the reaction rate is $(dx)/d(W/F)$, the slope of a tangent to a curve shown in Fig. 1 is the instantaneous rate of reaction at that particular value of W/F and conversion. Thus, the values of r may be obtained from experimental data by taking tangents to the total conversion curves.

In these curves we have the choice of basing the W/F value and the x upon the total feed or of basing these values upon one component in the feed. In either case the bases for expressing x and W/F must be consistent.

Differential or rate data are taken from experiments where the rate of reaction can be measured directly. In

these cases the data are available as r values and there is no need for graphical differentiation. This method of obtaining kinetic data is superior to total conversion data but, as we'll show later, the experimental difficulties of obtaining data this way are greater than for total conversion data.

Experimental Methods of Collecting Data

In order to obtain a rate equation for, and to determine the mechanism of, a chemical reaction, considerable experimental data must be collected. For these data to be useful for a kinetic study they must fulfill certain requirements.

Since the constants of the rate equation vary widely with temperature, the data for any series of runs must be isothermal. This means that during a run the temperature at any point within the catalyst bed must not vary. This is a condition that is difficult to obtain experimentally. Since heat is either being put into or removed from the catalyst bed at a rapid rate, it is almost impossible to eliminate transverse temperature gradients.

The best we can hope for is to keep these temperature gradients as small as possible. Also, since the amount of reaction at any given point along the length of a catalyst bed varies, it is almost impossible to eliminate longitudinal temperature gradients.

The problem is usually handled by surrounding the tubular reactor with a heavy metal cylinder. The heat is supplied to the outer core and is distributed through the core to the reactor. The high heat transfer coefficient and large mass of the core cause a better distribution of heat. Thereby, more nearly isothermal conditions are obtained within the reactor.

There are other methods for keeping an experimental reactor in an isothermal state. One is to immerse the reactor in a boiling liquid or in a molten salt. For high temperatures the boiling liquid is usually Dowtherm. Molten lead is often used as the metal.

Flow Reactors Best for Kinetic Data

Kinetic data for catalytic systems are best obtained in flow reactors. Any change in catalyst activity can be detected and corrected for in a flow reactor. In a batch reactor, a decreasing catalyst activity would not be taken into account. In a flow reactor the time factor depends upon flow rate. If conversion drops off during a run while the flow rate is constant, it must be due to a decrease of catalyst activity.

An experimental flow reactor usually consists of a reactor tube, a surrounding metal core, heating elements and suitable recording devices for temperature and pressure. The reactor tube contains a support for the catalyst bed and a section for preheating the gases. The preheating section of the tube contains a spiral core so that the gas will pass rapidly through the preheat section and will come into intimate contact with the hot metal of the walls and core.

It is important that the reactants be brought up to reaction temperature before entering the catalyst bed. The temperature within the bed must be kept as nearly constant as possible. After leaving the bed the products pass through a cooling section and then a condenser.

Experimental Equipment for Kinetic Studies

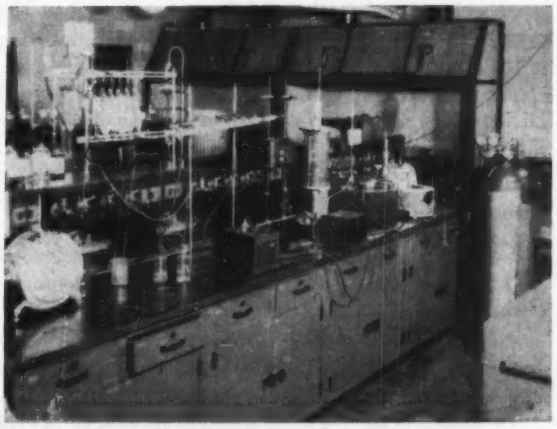
The photograph below shows a bench-scale reactor that was used in a study of the kinetics of the steam methane reaction.[2] Curves such as those in Figs. 1 and 2 can be obtained in a set-up like this. All the points on any one curve must be obtained at a single value of temperature and pressure. The rate of reaction is then found by measuring the slope of a tangent to the curve at any desired point.

When used as a differential reactor, the flow rate and catalyst bed are adjusted to give a very low residence time of reacting mass within the catalyst bed. The amount of conversion in one pass is then very small. The conversion may be treated as a differential quantity, dx, and the value of W/F is small enough to be regarded as a differential quantity, $d(W/F)$. The ratio $dx/d(W/F)$ is then the rate measured directly.

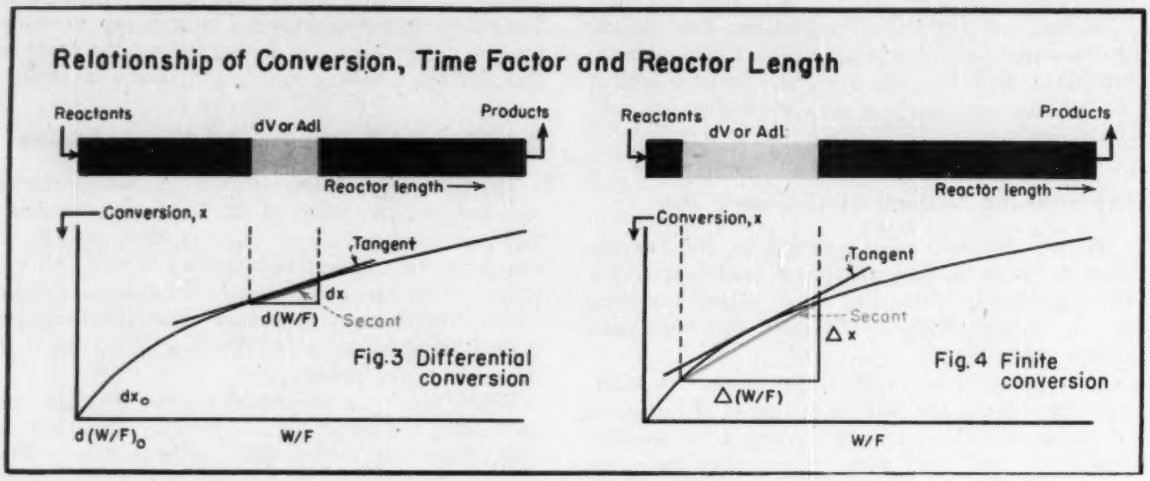
If the feed to the differential reactor is unconverted reactant, the ratio $dx/d(W/F)$ is then the initial rate, r_o, and corresponds to the slope of the x vs. W/F curve at $x = 0$. To obtain rates other than the initial rate, the feed to the differential reactor must contain a mixture of reactants and products corresponding to the degree of conversion to be studied.

The relationship between the integral and differential data can be best illustrated by Fig. 3. Here dx represents the total conversion in the differential reactor and $d(W/F)$ is the W/F value. The ratio, $dx/d(W/F)$, is a secant to the x vs. W/F curve.

With small increments the secant to the curve is practically the same as the tangent. The larger the increment used in the differential reactor, the less accurate is the approximation of secant to tangent. There is no definite dividing line between that amount of conversion called differential conversion and that



BENCH-SCALE REACTOR for kinetic studies.



called finite conversion. Fig. 4 shows an example of the case where the increments are too large to be considered a differential reactor.

Integral and Differential Reactors

In determining kinetic data the reactor may be used as either an integral or a differential reactor. In the first case the feed is generally unconverted reactant. The reacting mass remains in the reactor long enough for a finite amount of conversion to take place. Total conversion is determined by analysis of the products. This total conversion is determined for several values of feed rate and is plotted against W/F as described above.

Neither the integral nor the differential reactor is exclusively superior to the other. The chief advantage of the differential reactor is that it measures rate directly. Since most catalytic kinetic equations are in terms of rate, this term can be used directly to check the equation. One disadvantage is that because of the small conversions involved, the analysis must be extremely accurate. In some reaction systems the required accuracy would not be possible.

Another disadvantage is that although initial rates can be determined easily enough by using pure feed, rates corresponding to volume elements other than the initial one would require the use of feeds consisting of the same mixture of reactants and products that correspond to the desired value of conversion. This would be virtually impossible in a system that involved many side or secondary reactions.

Integral Reactor Most Practical

The method most often used in experimental kinetic work is the integral reactor study. The advantage: chemical analysis need not be so rigorous for a reasonable degree of accuracy because it is total conversion that is measured. Also, in each case the feed may be pure reactants (except for recycle studies).

The main disadvantage of the integral reactor is that the rate is not measured directly. The rate is the slope of a tangent to the curve. Therefore, it is the shape of the curve rather than the value of the ordinate that determines the rate equation. Any slight scattering of the experimental points would have a great effect upon the values of these slopes.

Another disadvantage of the integral reactor is that the portion of the x vs. W/F curve which is most important in determining mechanisms is at low values of W/F. Yet in this portion the accuracy of analysis becomes increasingly important since the conversion is low. Total conversion values become as difficult to obtain as differential reactor values when W/F approaches zero.

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NEXT MONTH

We'll begin a discussion on how to interpret kinetic data, explaining how to obtain experimental data, precautions to be taken and pitfalls that may trap the unwary kinetics experimenter.

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Many types available for handling oils, gasoline, other organic corrosives. Often used for higher heat resistance. Evaporator head at left, for instance, works at 212° F.



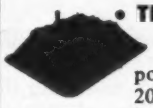
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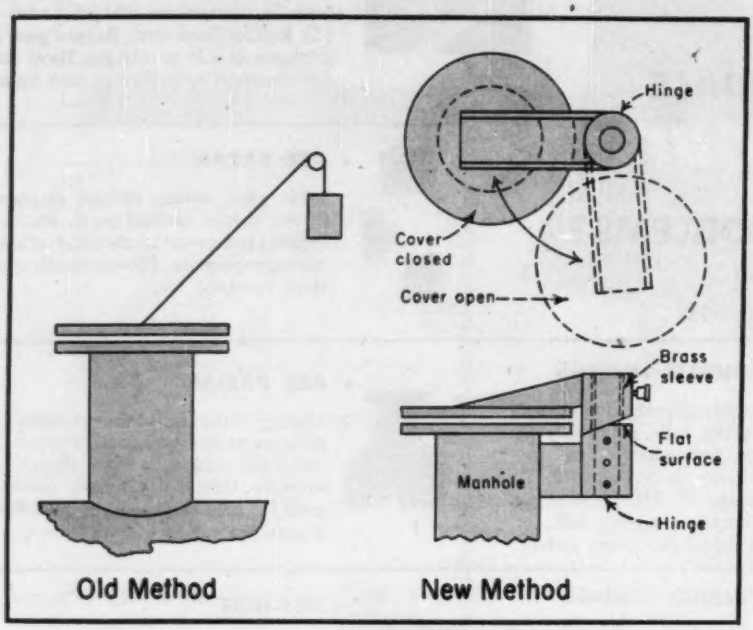
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★ December Contest Prize Winner

Cover Hinge Defeats Headroom Problem

Robert J. Ford and Robert J. Larson

Assistant Supervisor and Supervisor, Chemstrand Corp., Decatur, Ala.

When placing some new equipment in an area of low headroom we found it necessary to eliminate the cable and counterweight arrangement we had previously used for lifting a series of heavy 30-in. manhole covers. The old method is at the left in the sketch above.

We found the solution to the problem in development of a pivot-type hinge for the manhole covers which allows them to be swung to one side. The new design appears at the right in the sketch.

The machine shop fabricated a 4-in. diam. hinge as shown at the right above, with an inclined face designed to lift the cover as it is swung to the side. The back half of the incline on the lower part of the hinge was cut off horizontally so that, in the open position, the upper portion of the hinge comes to rest on a flat bearing surface. This was done to prevent the possibility of the cover sliding back down the incline and shutting of its own accord.

To make sure of easy operation, the top portion of the hinge is finished off with a brass sleeve and grease fittings.

Simple Way to Sample Metal Melts

R. Volterra

General Plate Div., Metals & Controls Corp., Attleboro, Mass.

In sampling metal melts, it is good practice to obtain a so-called "dip sample," that is, to take the sample by means of a ladle from the melted bath.

In the case of crucible meltings, and where the sample need not be very large, I have found it helpful to use a sampler described here which is simple and effective.

Use a graphite stirrer as large as 2½ in. diam., or as small as ½ in. Near the lower end drill two holes from opposite sides, slanting downward and meeting at the axis of the stirrer.

The stirrer is first used to homogenize the melt. Stirring helps to clean the cavity in the stirrer, displacing any slag from the holes. Then lift the stirrer quickly out of the melt, remove it from the furnace and shake into a clean pail filled with water, thus obtaining fine metal grains which are a good, representative sample of the melt.

★ January Contest Prize Winner

"Quick Method for Cost and Weight Comparison of Piping Materials."

A prize of $50 in cash will be awarded to Carsten F. Boe, Professional Engineer, Malvern, Pa. This method easily discloses comparative advantages and will be described in the April issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook. Each month's winner will be announced the second following month and published the third following month.

$100 ANNUAL PRIZE—At the end of each year the monthly winners will be rejudged to determine the year's best Plant Notebook article, which will then be awarded an additional $100 prize.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible. Acceptable but non-winning articles will be published at regular space rates ($10 minimum).

Articles may deal with plant or production "kinks," or novel means of presenting useful data, which will interest chemical engineers. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 36, N. Y.

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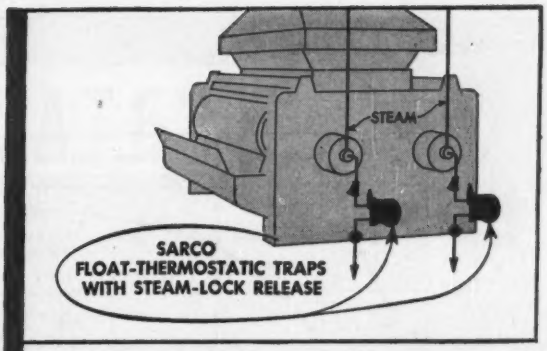
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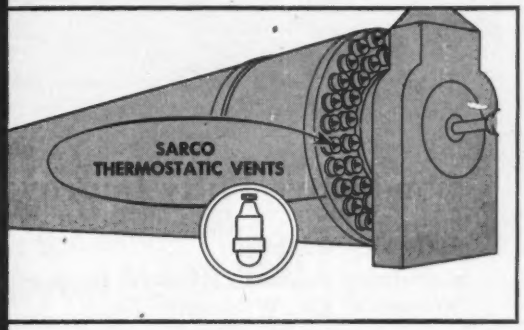


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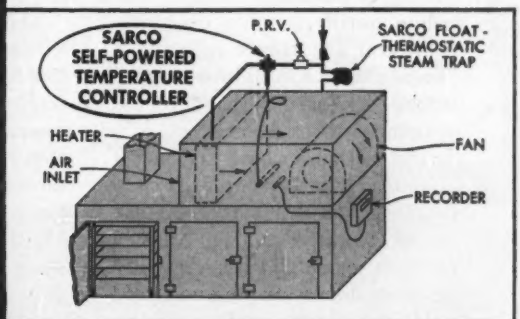
SPOTTY DRYING ELIMINATED: This atmospheric double drum dryer periodically waterlogged because of steam-lock in syphon pipe. Cold spots on drum surfaces, uneven drying and production slow-downs resulted.

By simply replacing the original traps with Sarco Float-Thermostatic Traps equipped with built-in steam-lock release valves... these drying troubles were completely eliminated.



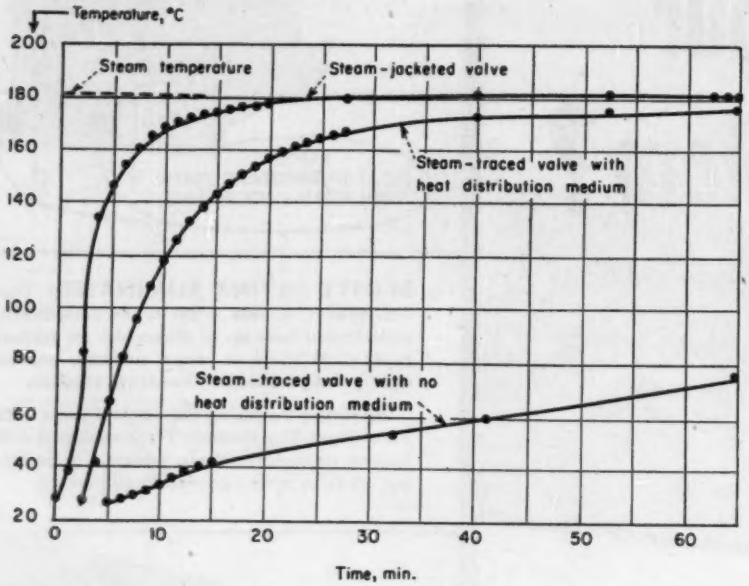
CURE FOR SLOW WARM-UP: When air gets into steam spaces of a dryer it forms a heat-insulating film between the steam and heat-transfer surfaces... efficient transfer of heat from steam is impossible. Result: slow warm-up; prolonged drying time.

Simple, inexpensive cure for this condition are Sarco Air Vents, such as installed on above rotary steam tube dryer.

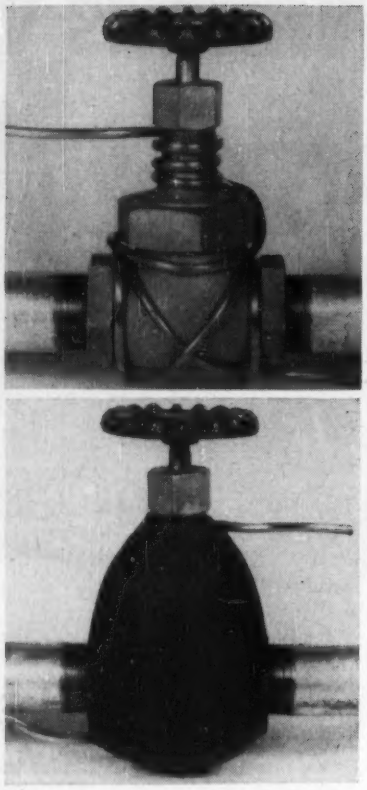


TEMPERATURE PROBLEMS SOLVED: Manipulating steam valves to control temperature wastes manpower and steam... is often the cause of product spoilage.

Sarco Self-Powered Temperature Controllers, as on this tray dryer, solve this problem ...hold dryer at maximum temperature without danger of overheating. Inexpensive, simple and dependable.



Heat rise of oil in 1½-in. stainless valves varies with heating method—(Fig. 1)



Steam-traced stainless valve before and after applying putty—(Fig. 2)

Conductive Putty Improves Steam Tracing

V. Wesley Weidman

Engineering Research Laboratory, Engineering Dept., E. I. du Pont de Nemours & Co., Wilmington, Del.

Vapor- or liquid-filled jackets are frequently used on pipelines, valves, or process equipment in order to maintain a desired product temperature for purposes such as control of viscosity, or prevention of crystallization, polymerization, or freezing of process fluids. This procedure usually is quite expensive. A low-cost alternate to jacketing is "tracing" with a small tube wrapped around or placed adjacent to the equipment to or from which it is desired to transfer heat. Tracing is quite readily installed, but its effectiveness is limited by the air gap or lack of direct contact between the heat source and receiver. As a means of improving performance, a solid heat-transfer medium has recently been developed which is applied over the installed tracing in the form of a plaster or putty which hardens in place on air-drying.

This material is based on the use of three constituents: graphite, a high-thermal-conductivity powder; clay, to impart workability; and a sodium silicate binder. A mixture consisting of 10 parts by weight of graphite powder, 1 part clay, and 5.5 parts sodium silicate, was found to be an effective heat-transfer medium. The cost of the materials in this mixture is approximately $0.10/lb.

The performance of this mixture on unjacketed stainless steel valves that were traced with ¼-in. O.D. copper tubing was determined by comparison with (1) a steam-jacketed valve, and (2) a steam-traced valve with no heat-conducting medium. These 1½-in. valves were filled with a lubricating oil. Then, using steam at 145 psig. in the trace line and the jacket, the rate of temperature rise in the center of the valves was measured. The relative performance of these three jacketing systems is shown in Fig. 1.

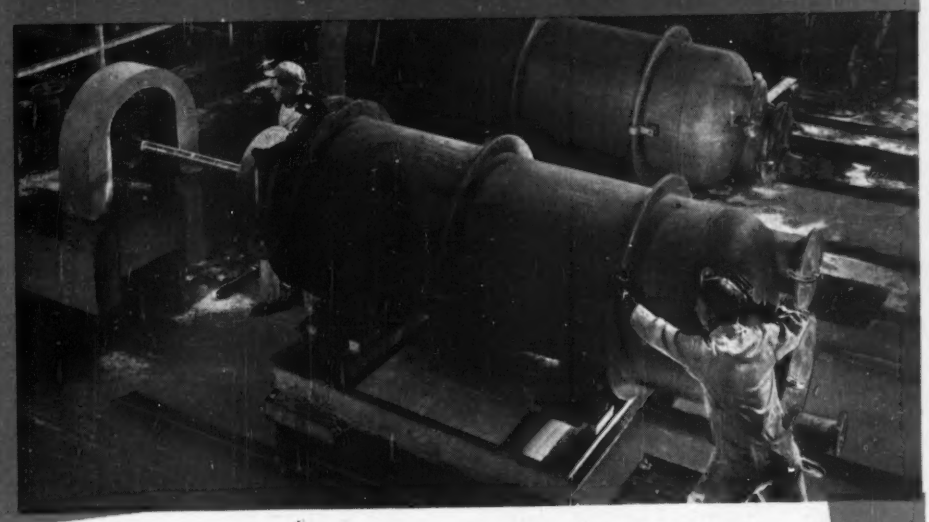
Performance under these static conditions of thermal loading remained unchanged throughout a 270-hr. exposure to temperature including 30 cycles of heating to about 180 C. (145 psig. steam pressure) and cooling to room temperature. During this exposure, the solid heat-transfer medium suffered no marked degradation such as excessive shrinkage, cracking, or spalling.

Heat-transfer effectiveness of the graphite mixture under steady-state conditions of thermal loading was appraised on unjacketed Schedule 40, 2-in. steel pipe that was traced with two straight lengths of ½-in. O.D. copper tubing spaced at 180° from each other. Passing hot (60 C.) water through the pipe and 145-psig. steam countercurrently through the tubing, an overall coefficient of heat transfer of 47 Pcu./(hr. sq. ft. °C.) based on tracer pipe O.D. was obtained for the graphite-covered case as compared to 4.2 Pcu./(hr. sq. ft. °C.) for the unit without the heat-transfer medium.

The material is compounded by blending two sizes of graphite powders and clay, after which sodium

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silicate is added to produce a workable mixture. This is easily and rapidly applied by trowelling. After hardening by air drying, the material has a thermal conductivity of 25 Btu./(hr. sq. ft. °F./in.) at a mean temperature of 290 F. The top-use temperature limit is approximately 750 F.

This material exhibits low shrinkage, a specific gravity of 1.4, shows excellent adhesion to metals, and has high impact resistance. Although drying time varies with temperature and humidity, a layer of this material ½ in. in thickness is usually sufficiently dried in about 24 hr. under ambient conditions for the subsequent application of thermal insulation. Drying rate can be accelerated by the gradual application of heat through the tracers.

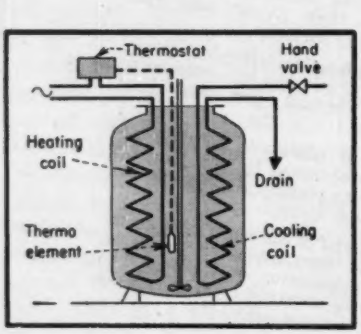
The materials for this solid heat-transfer medium are as follows:

1. Sodium silicate: technical grade 1 $Na_2O/3.25\ SiO_2$ (Chemical composition: 8.7% Na_2O, 28.4% SiO_2, 62.9% H_2O by wt.).
2. Clay: finely-divided plastic clay.
3. Graphite: a blend of electric furnace graphite having the following approximate particle size distribution:

Mesh	Weight, %
10	17
20	38
35	8
200	8
−200	29

A cubic foot of the wet graphite mixture can be made from these materials supplied in the following weights: graphite, 66.0 lb.; clay, 6.6 lb.; and sodium silicate, 36.4 lb. The wet mix weighs approximately 109 lb.; when dried, the residue weighs about 90 lb./cu. ft. The usual safety precautions for sodium silicate should be observed in mixing and applying this material. Applications of the solid heat-transfer medium must be allowed to dry and then are normally covered with a suitable thermal insulation system. A typical example of the use of this low-cost alternate to jacketing is illustrated in Fig. 2.

The contributions of R. L. Burdick, G. E. Guy, R. S. Hagerman, A. C. Mueller, and F. J. Staudt to the development described in this note are gratefully acknowledged.



Over-Cooling Plus Heating Controls Temperature

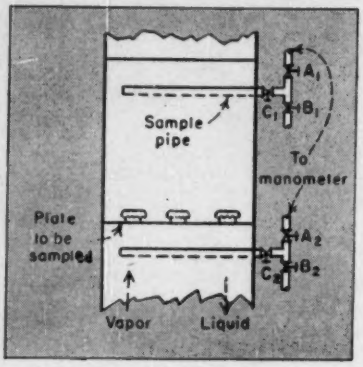
F. Stahl
Chemist, Strasbourg, France

In a pilot plant investigation it was initially necessary to provide controlled heating of the reaction vessel contents. For this purpose I provided a heating coil controlled by a thermostat. However, during the course of the research, the process was modified so that the reaction became slightly exothermic, and it was no longer possible to control the temperature.

On this account I also installed a cooling coil. An automatic valve for controlling the cooling water flow rate was not immediately available, so I used a hand valve and a very simple method of operation and control which avoided holding up the investigation until an automatic valve could be obtained.

First I set the water flow with the hand valve so that the reaction mixture could be cooled below the desired temperature, regardless of fluctuations in the exothermic reaction. Then the heating coil, which had been left in place, provided enough heat under control of its thermostat to compensate for the excess cooling capacity of the cooling coil.

This method worked well and gave satisfactory control of the temperature. While it would probably not be suitable for a production unit, it is a convenient system for development purposes, both with a process such as that described, and with processes where heat is required at the start, followed by cooling when the reaction gets under way.



Samples Column, Measures Pressure Drop

Om P. Kharbanda
Research Dept., Simon-Carves, Ltd., Stockport, England.

In a liquid-vapor contacting device, such as an absorption or a distillation column, it is often necessary to sample the vapor entering and leaving each plate, as well as to measure the pressure drop across each tray. In customary practice, separate connections are used for the two purposes. Hence, in taking the pressure drop reading, considerable difficulty is encountered due to condensation of vapor in the lines.

By use of the device described here, this difficulty is easily overcome. Furthermore, the device has the additional advantage that it can be used as a vapor sampling line as well.

The use of this device is best described by means of the sketch above. Suppose it is desired to sample the vapor and measure the pressure drop across any particular plate. The T-shaped sampler shown above is inserted in the column both above and below this particular tray. The part of the device inserted into the column may pre-



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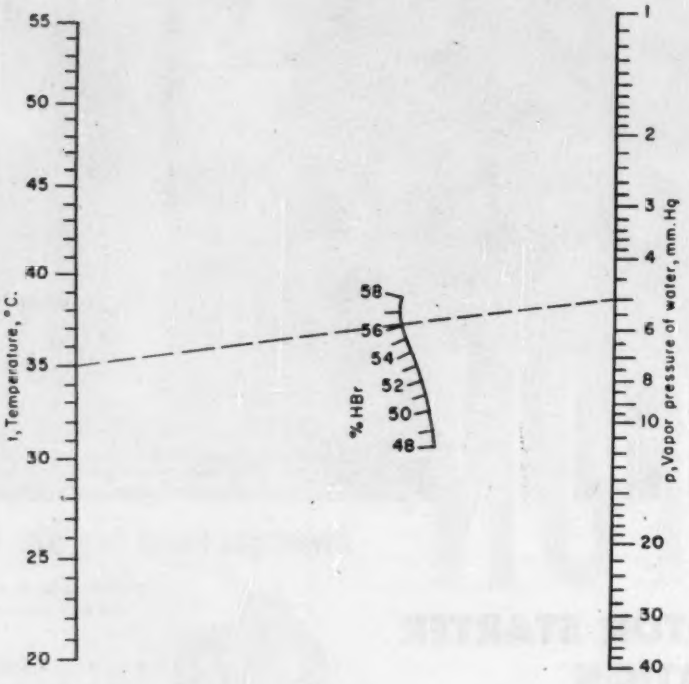

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ferably be made in the form of a "thief," with a series of holes on the under side, so as to obtain an average vapor sample. This is connected on the outside of the column to a short length of tubing by means of cocks as shown in the figure. The arms A_1 and A_2 are connected to the manometer through appropriate traps.

The procedure for using the device is as follows: Open A_1 and A_2 to allow any condensate to drain down in the sampling tube. Then close A_1 and A_2, and open C_1, C_2, B_1 and B_2. The condensate has now drained out of the sampling line so that the vapor sample can be collected in an appropriate sampling bottle after passage through a water-cooled condenser. B_1 and B_2 are now closed, and A_1 and A_2 opened. The pressure drop reading is then taken on the manometer. You may have to repeat this procedure if you see condensate accumulating in the lines which lead to the manometer.



Water Vapor Pressure of HBr Solutions

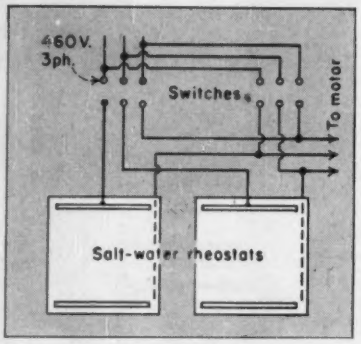
D. S. Davis

Professor of Chemical Engineering, Virginia Polytechnic Institute, Blacksburg, Va.

The line coordinate chart above permits convenient and accurate estimation of the pressure of water vapor over aqueous solutions of hydrogen bromide. It is based on the equation $\log p = A + B/(t + 230)$, where p is the vapor pressure of water in mm. Hg, t is the temperature in °C., and A and B depend on the concentration of the solution.

The chart has been constructed from reliable data in Perry's "Chemical Engineers' Handbook," 3rd Ed., p. 170. Its use may be illustrated as follows:

What is the vapor pressure of water over a 56% hydrobromic acid solution at 35°C.? Connect 35 on the t-scale with 56 on the concentration scale and read the desired pressure of water vapor as 5 mm. Hg on the p-scale.



Salt-Water Motor Starter Prevented Long Shutdown

Paul C. Ziemke

Engineer, Oak Ridge, Tenn.

When an accident occurred to an emergency lighting engine, the fast-flying fragments of the cylinder head crashed through a bank of cast iron grid resistors on a 35-hp. agitator motor. The maintenance engineer was in a quandary since lack of the necessary resistor parts meant a prolonged shutdown, unless some other starting method could be improvised. Starting the motor across the line proved unsuccessful, as the high initial inrush of current immediately blew the fuses. The idea of a double set of switches, one very heavily fused for starting, was abandoned for lack of suitable switches.

Fortunately, the chemical engineer had an idea. He procured two wooden firkens from the plant cafeteria from which salt-water rheostats could be made. Each tub was equipped with a top and bottom electrode made from stainless steel blank covers, 18 in. in diameter. The upper electrodes were suspended just below the liquid level with rubber gasket material. Then connections were made as in the sketch. To start the motor the lefthand switch was thrown. When the motor was up to speed, this switch was quickly opened and the righthand one closed.

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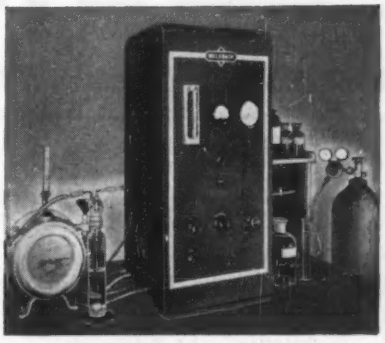
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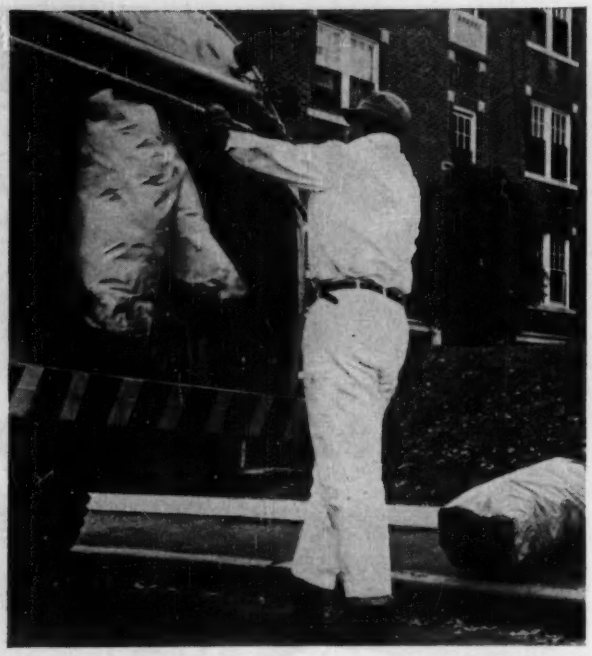
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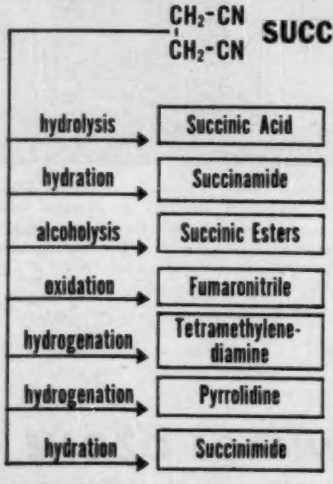
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"MOST GLAMOROUS GARBAGE IN THE WORLD." That's what residents said of a new garbage collection system tested by Hartford, Conn., and Cyanamid and Union Bag and Paper Corp. It eliminates garbage spillage, odors, return trips by the collector, banging of cans on sidewalk and truck. This "package system" uses a paper bag made with Cyanamid's Melostrength® Resin, which gives paper exceptional strength, wet or dry. (No. 2)

Life...on the Chemical

New Product News

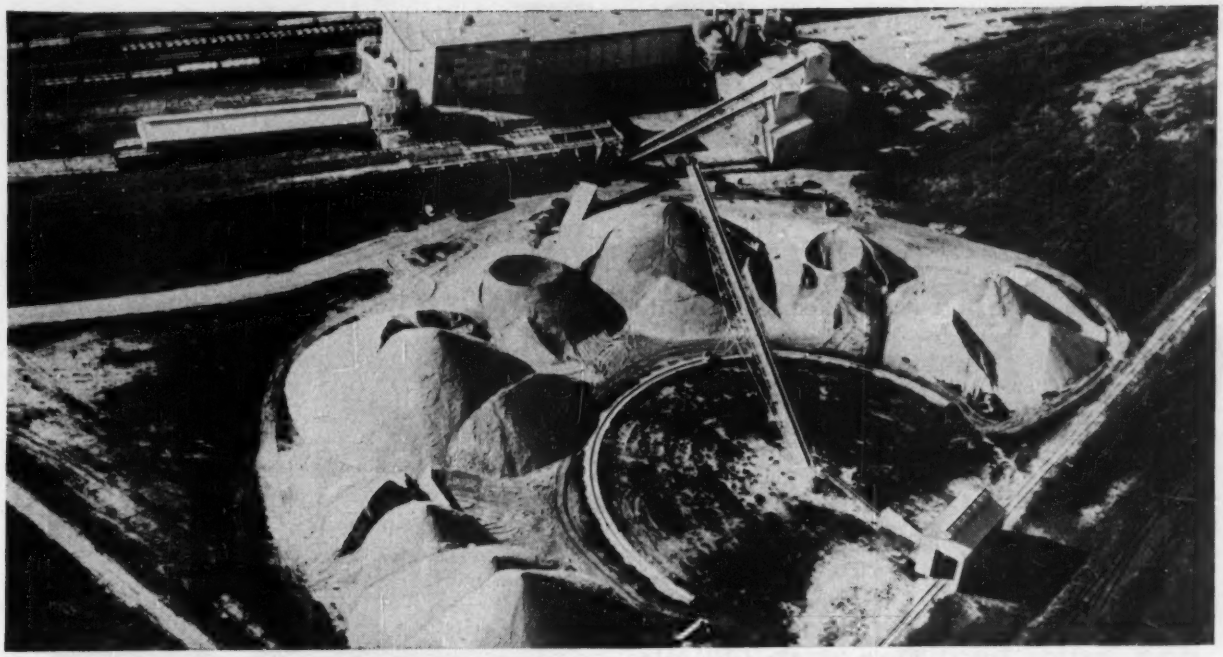


This reactive aliphatic dinitrile now is available in *semi-commercial* quantities.

The reactions of succinonitrile may be utilized to prepare a variety of bifunctional chemicals which find application in the fields of resins, pharmaceuticals, surface active agents, and dyestuffs. (No. 3)

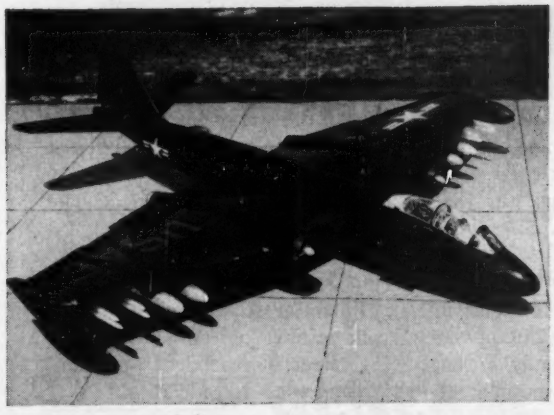


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AROUND THE CLOCK SERVICE to Cyanamid's customers is provided by modern phosphate mining, processing and handling facilities at Brewster, Florida. The rotary stacker-conveyor (above) helps expedite customers' shipping schedules of high-grade phosphate of the desired analysis for both agricultural and industrial uses. In this system, the boom stacker dumps rock at the rate of 800 long tons per hour from a height of 86½ feet. Underneath the piles of rock is a kidney-shaped tunnel—approximately 1,025 feet long—which contains two 24" belt conveyors for carrying the phosphate rock to the Drying Plant in the background. There the rock is dried, further sized if customer requires, and loaded for shipment. Equally specialized equipment also speeds mining and processing, helping Cyanamid to give unusually flexible service to users of this basic chemical. (No. 5)

Newsfront



STARTER CLUTCH MECHANISMS for the sleek new Martin B-57b bomber are getting a new carburizing treatment. Made by General Electric's Aircraft Accessory Turbine Dept. at Lynn, Mass., these parts are carburized in Cyanamid's new high-speed AEROCARB® S and R Carburizing Compounds. They give deep, rapid penetration, minimum distortion. (No. 6)

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Do You Really Want to Be an Engineer?

Donald B. Keyes

You have probably been given much sound, practical and concrete advice about how to look for and how to secure a job. I am going to take the calculated risk of telling you bluntly what is on the minds of many of us when we evaluate you as potential employees. We disguise this interest with carefully worded sociological and psychological questions, but what we want to know, what we must learn, is: Do you really want to be an engineer?

Donald B. Keyes *is known and respected throughout the chemical industry. Engineer, educator, executive, government administrator, consultant and author are among the titles he has held. Now associated with Arthur D. Little, Inc., he authored this article for a number of engineering college publications. Though originally intended for the undergraduate, it bears retelling.*

There are many opportunities today for the young man who sincerely loves his profession and can demonstrate his abilities. There always are. The men I know who graduated during the early thirties in the midst of the depression thought they had a pretty tough time, but 90% of them were located in positions within six months after graduation. Many of them now hold very responsible positions in industry and in the technical world. Their chief characteristic then, as now, was that they really loved their profession.

Fringe Fascinated Graduates

Today, however, there seems to be generated in the minds of our college graduates, especially our engineers, a philosophy peculiar to the times. Personnel directors interviewing men in our colleges tell me that you are inclined to inquire first of all, not about the character of the job, but about pension plans and fringe benefits.

A research engineer who recently retired as the executive of a large corporation told me that now, although his retirement allowance is $45,000 a year, he is forced to continue to work for a living. Over the years he has acquired some rather expensive tastes and because of the tax situation and inflation, he cannot maintain his standard of living on his present pension, even though the size of his pension may look large to most of us. Even if you have a pension in your old age, it will probably appear inadequate from your viewpoint.

How Valuable Is "Security?"

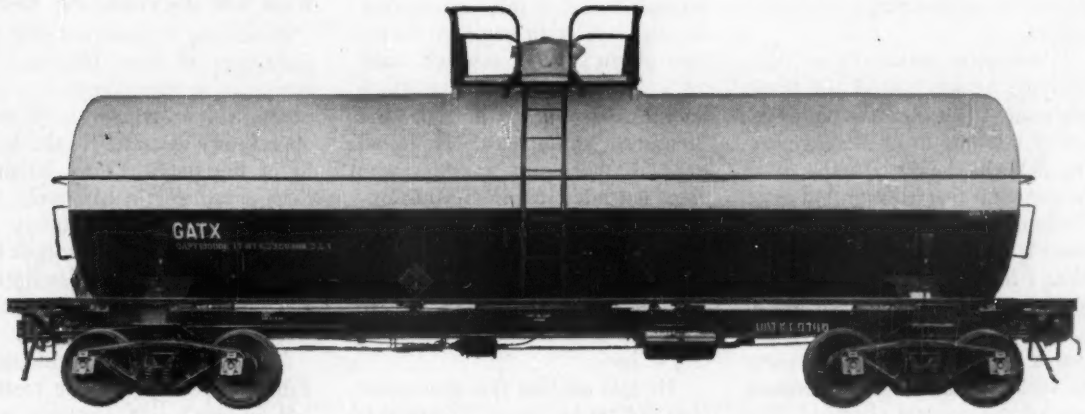
Financial security must not be your primary objective. A rewarding career is dependent upon this fundamental consideration: Will the type of engineering you have elected offer you the incentive, the curiosity and the urge to work hard and "go places."

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"The capable man should find unlimited opportunities in the engineering field."

Looking back over the years, I know of only one of my acquaintances who seems to have acquired real financial security. The state takes care of him and will do so as long as he lives. He paid a very high price for this security, but in fairness to this individual, may I say that he did not wish it this way.

On the other hand, taking a typical example of one of my friends who has been very successful in the engineering field, I know of no time when he was actually financially secure. After working up to general manager of a company, he decided that the future of this company was not too good; it was in a very specialized field. He then became an engineering college professor.

It was quite obvious to me that, although he was one of the finest professors I had ever had the pleasure of listening to in the engineering field, he would be unhappy if he stayed in that position too long. Evidently, his thoughts were along similar lines, for during World War I he became the president of a war company. With the aid of a very competent staff of young people, he developed this company to such an extent that it became one of the greatest chemical companies of its day. The financial backers of this company, however, did not appreciate the vision of my friend. When he discovered that he could develop the company no further, he promptly lost interest, resigned, and became a consulting engineer.

It wasn't long before another concern, wishing to develop the chemical end of their business, hired my friend. For many years he gave all that he had to the development of this group. His success was phenomenal, and today this company is one of the truly great chemical concerns in the world. He remained active, upon request, long after his retirement age. When he finally retired, he still retained an active interest. Today he is still active and still very happy.

At no time in his career, as far as I know, has he ever sought to work for his own financial security, but has given his all to the development of every organization with which he has been connected. It should be remembered, too, that he liked what he was doing, and when he didn't, he changed to a new job that he did enjoy.

Why Be Stifled?

Shortly after World War II, another friend of mine, prominent in war work as an engineer, joined one of the smaller research units of a large company. After three months he quit. He could not stand the "atmosphere." He found men in their early twenties who were not interested in creating anything. Merely interested in their pay, their fringe benefits, and their old-age security, they were actually looking forward to the time when they could retire and quit working for a living.

He told me that this atmosphere just got on his nerves, so much so that, although he was older than his colleagues and liked his particular job, he could not work there any longer.

Creating vs. Money-Making

One of the best examples of a successful industrialist, an engineer whom I knew in the old days, was Herbert Dow, the founder of the Dow Chemical Company. If one reads the history of this company, one is impressed with the fact that its founder not only was seemingly uninterested in personal profit, but in the profits for the company. He took the attitude that a company's growth depended on its ability to produce new products useful to the public at a price the public could afford to pay.

He apparently reasoned that if one was successful in creating these new products at a price, the profits would come automatically—which they did.

The same principle was applied by another old friend of mine, who started his first company with $243 when he was seventeen years of age, and developed an "empire" worth, at the time of his death, over $25 million. This man told me on several occasions that the love of creation, and not of money, was his guiding principle. He told me that large profits obtained in a single year through the sudden development of a new product were always embarrassing to him, as his stockholders expected him to re-invest this sum immediately to make an equal percentage profit—something that usually cannot be done.

What Will the Public Pay for?

Permit me to point out that the philosophy of these two men, so dissimilar in background and education, was a desire to seize every opportunity to create for the benefit of the public. They obtained their enjoyment in hard work and during their working hours. If either one of them at any time had fringe benefits of any description, I certainly do not know what they were.

The enormous amount of energy Edison spent not only in creating but in promoting electrical engineering developments in order to satisfy the public is still appreciated. Many years ago the courts decided that the Edison patents on the moving picture machine were the basic ones, although three satisfactory moving picture machines had already been invented and developed by other persons prior to Edison's. But these three had been "abandoned." The court pointed out that Edison had not abandoned his invention but had spent an enormous amount of time, energy, and money in seeing to it that the public received the benefits.

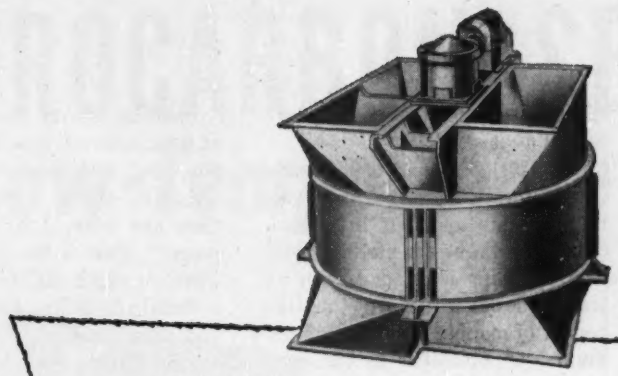
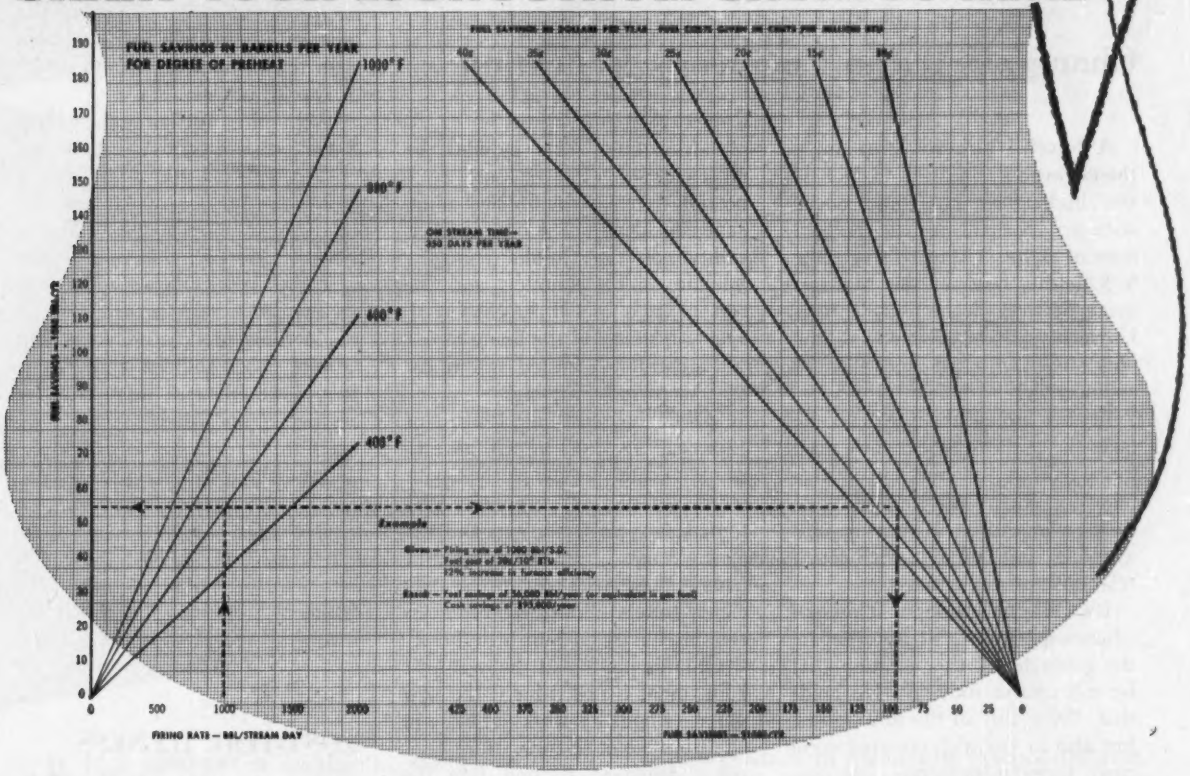


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Start at the firing rate in your process units . . . allow a reasonable amount of air preheat (the higher the preheat, the more you'll save) . . . and look to the left for fuel savings. To convert that figure to cash — move to the right to your fuel cost line, and check your savings directly below.

The savings you'll discover for yourself are not fantasy, either. They simply prove why a Ljungstrom® Air Preheater will pay for itself in eighteen months . . . a year . . . even nine months or less —in fuel savings alone!

And that isn't all. When you add to this the increased production . . . higher product quality . . . decreased furnace maintenance typical of operations including a Ljungstrom — you'll see why the Ljungstrom Air Preheater can be the oustanding factor in your refinery for *top economy and throughput*. Write today for full details.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

It was no more than human for the court to agree to give the credit to Edison rather than the prior inventors. Creation for the benefit of the public is what the public wants and, incidentally, what they are willing to pay for.

Opportunities Unlimited

One must not only love engineering, but use one's knowledge and energy for the creation of something that is directly or indirectly of benefit to all. Profits will take care of themselves.

The capable young man with a sound educational background, with the desire to augment his knowledge throughout his lifetime, with a love for his work, and with an ardent desire to create for the benefit of mankind, should find unlimited opportunities in the engineering fields.

Do you really want to be an engineer?

Change Urged in Engineer's Education

A forceful plea for broadening the engineer's education to include the humanities, arts and social sciences appeared in the January issue of Harper's Magazine. George S. Odiorne, head of the Management Services Section of Rutgers University, argues that this is the only way to turn out more efficient engineers.

In his provocative article, he takes the position that today's need for engineers in not merely for more of them, but for more of them who can fit effectively into a world full of non-engineering relationships.

It's Odiorne's thesis that present educational practices fail to prepare the graduate for the situation that he will find in industry. He holds that, "Not only in the universities, but also in the high-powered company training programs, we continue to train them for jobs that in fact no longer exist.

"For the present-day engineer, the transition from university to laboratory or factory is easily made —it just means going from one school to another. His first year is frequently spent in what amounts to a post-graduate engineering course at company headquarters, where the technical principles learned at college are supplemented by the specific information the company requires.

"It is on graduation from this school that the engineer finds adjustment most difficult, for it is here that he must begin the process of 'unlearning.' Idea by idea, he must clear his mind of 'pure' engineering to make way for such mundane considerations as cost, marketability, consumer foibles, company folklore, union contracts and the personality quirks of the chief engineer—in short, all the finely tooled and delicately adjusted machinery that keeps society going.

"Often his work may consist of a 'project' in which he will have to communicate intelligently with other technicians, suppliers, customers, lawyers, advertisers and laymen. When he is incompetent to handle these relationships his efficiency suffers, and all too often his training has given him little help."

Odiorne points out that a similar adjustment is called for if the new engineer finds his work lies close to the frontiers of science. Here he is often dismayed to find that the questions that come up are not so catagorical as those in the classroom, and "answers" may be as indefinite as those in economics, sociology or the arts.

He goes on, "If he is unequipped to work in this climate of uncertainty and doubt, then his efficiency suffers further. Here again a great unlearning process must take place before he will be able to plunge, with relish and confidence, into problems that permit of no definite 'solution.' Inevitably the successful engineer will make this adjustment, but meanwhile time and effort—his own and others'—will have been wasted."

Odiorne himself does not arrive at a definite solution to this problem, but he does point to one which he terms, "more promising than any other I have seen proposed." This is the so-called "3-2 Plan" in which the student attends a liberal arts college for three years, and then transfers to an engineering institution for two years of instruction in an engineering specialty. In college the student takes enough math and science to prepare him for his later studies, but he is also exposed to more of the humanities, arts and social sciences than the engineering school could, or would, provide.

With this background making the adjustment will be easier, faster.

This solution, he concludes, is clearly not the way to beat the Russians at the game of "Who's Got the Most Engineering Graduates," but, he continues, a technical society is not measured by its productivity of degree-holders, but only of goods and services. Therefore, more efficient, more effective engineers; not merely more engineers are needed.

Broadening the engineer's education, Odiorne maintains, is the way to fill this need. At least, he contends, it will produce engineers who can fit effectively into "the 'unscientific' turmoil in which the rest of us live."

LOST-TIME ILLNESS

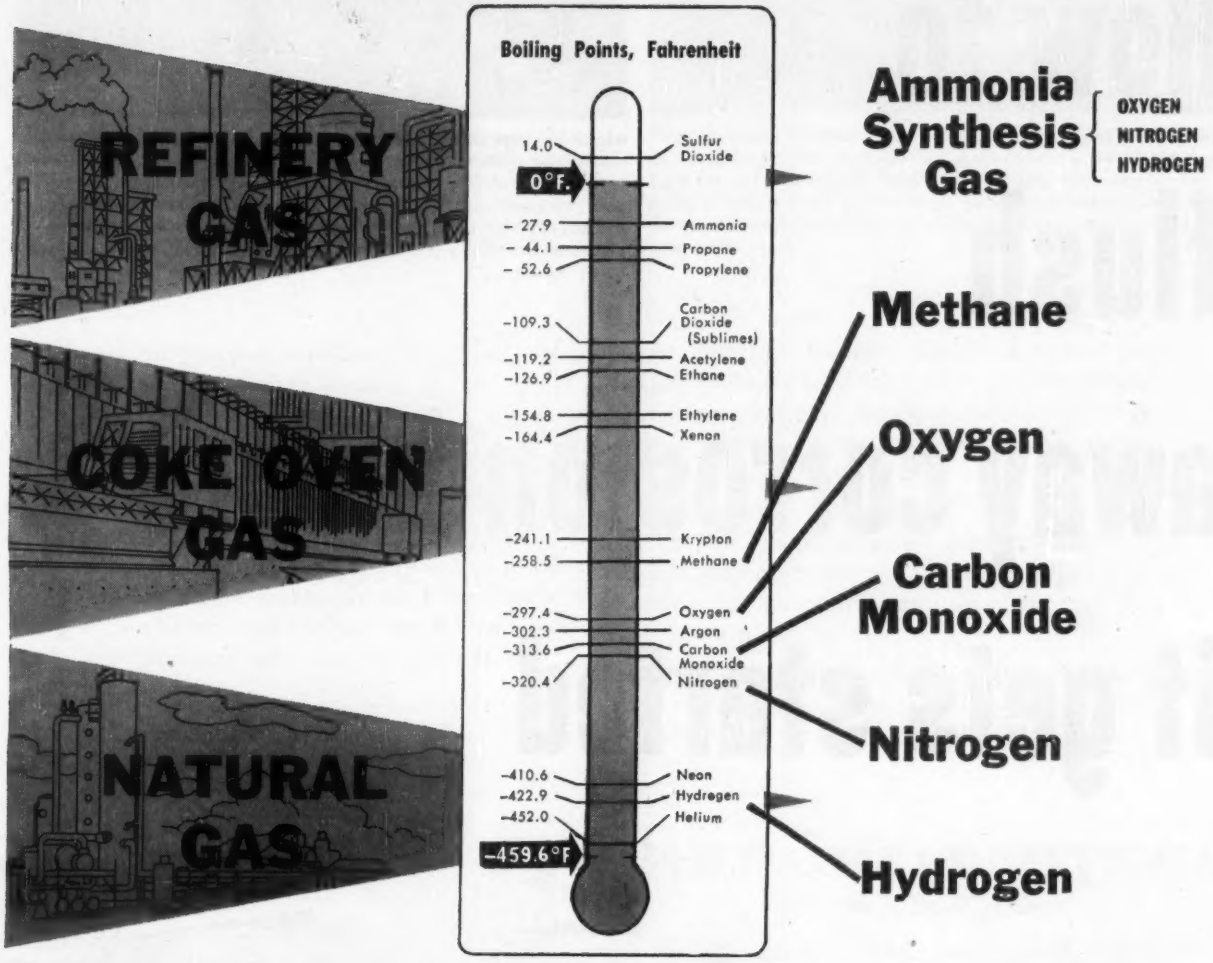
. . . *Youth No Help*

Oldsters, who have been relegated to the background recently in a general emphasis on youth, can take a bow over the results of a recent Du Pont survey.

Younger people, the survey finds, lose more time from work because of illness than do older men and women. In the 24-29 age bracket, 55% of all Du Pont employees surveyed had a time-losing illness last year. Among those in the 36-40 group, only 33% lost job time. The 55-60 bracket boasted a record of only 49% with lost time.

In all groups, few missed more than a week's time.

HYDROCARBON SEPARATION
by Low-Temperature Processing



IF YOUR COMPANY is among the many who are looking into the extra profit possibilities "hidden" in your fluid flows or by-product gases, in natural gas or in the air itself—check with *Air Products.* The low-temperature route is proving to be the most profitable for more and more separation processes. For example, many ammonia manufacturers — both petro-chemical and coal chemical—are using low-temperatures to produce oxygen and nitrogen . . . purify hydrogen . . . recover valuable by-product hydrocarbons.

Ask *Air Products* to investigate the possibilities of your hydrogen, hydrocarbon-rich streams. Leader in its field, *Air Products* has designed and built close to 700 low-temperature gas separation plants. Our more than 100 engineers are at your service. We can supply a preliminary engineering analysis, or a complete process design. Outline your problem to us—your inquiry will incur no obligation. *Air Products, Inc., Dept. F, Box 538, Allentown, Pa.*

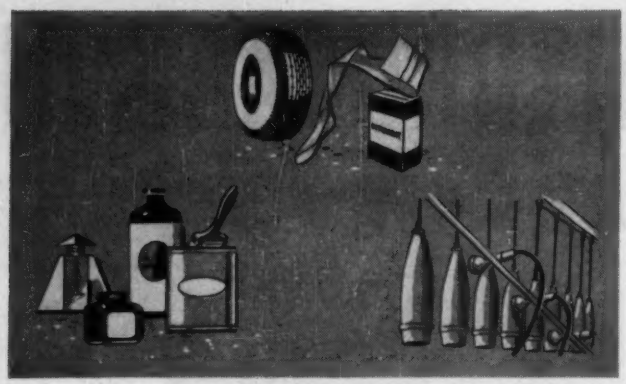


36-page BROCHURE explores the broad possibilities of low-temperature processing . . . illustrates *Air Products'* facilities. Write for a free copy.

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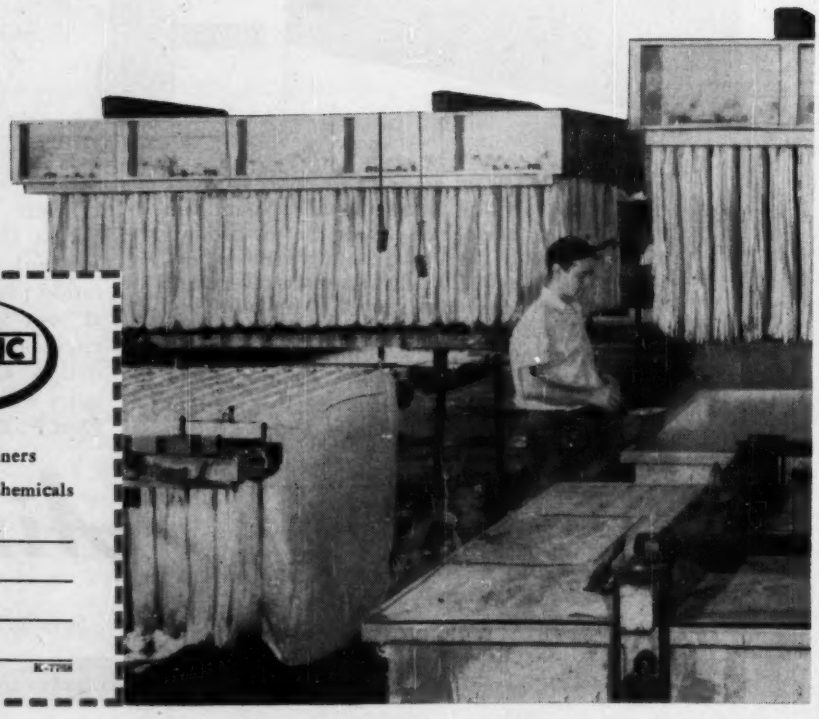
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How to flush away corrosion before it gets started



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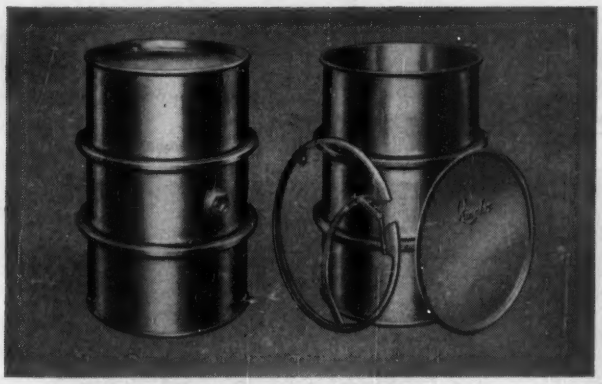
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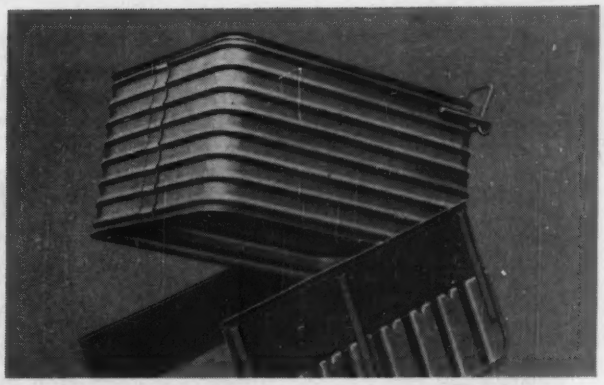
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YOU CAN REDUCE MATERIALS HANDLING COSTS at many stages of processing with Republic Materials Handling Equipment. Pictured is the PB-125 Dump-Type Box and Skid Unit. It's designed for efficiency and economy, can be operated by one man. Use it to handle light or heavy materials, wet or dry, hot or cold. Republic specialists will work with you in designing units to meet your specific needs.

Be sure your process equipment is made of Republic Enduro Stainless Steel.

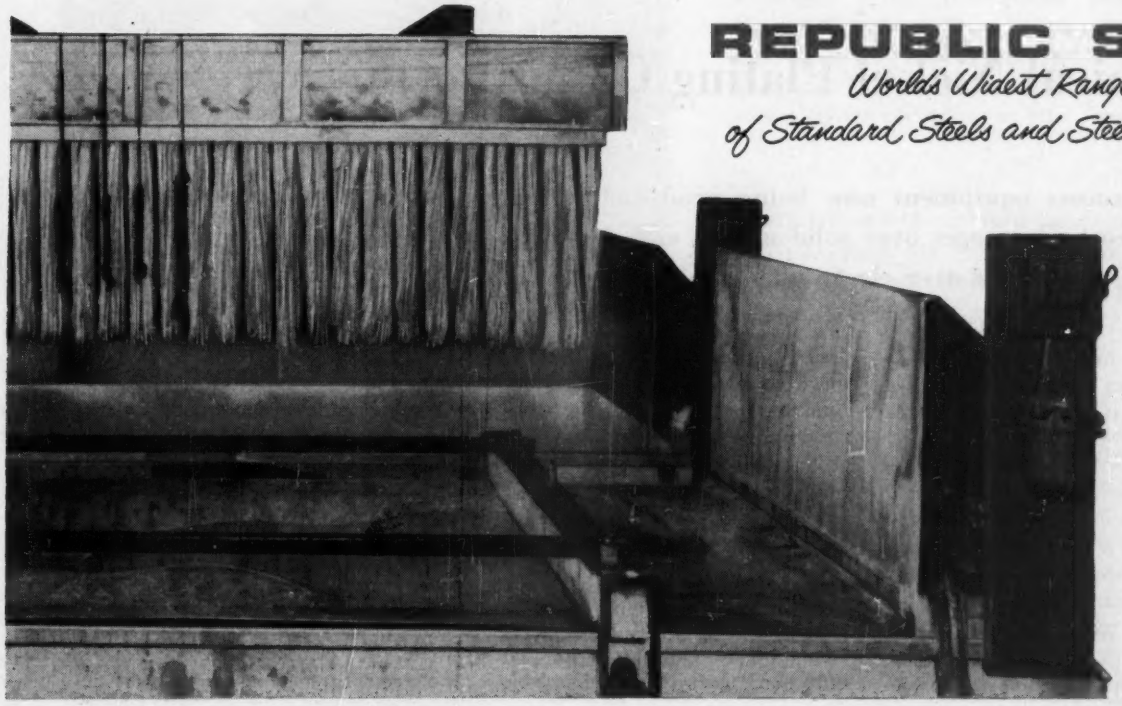
Take that yarn dyer shown below. Dye vats, racks and sticks are all Enduro Stainless Steel. Just a quick, simple wash and the next batch is ready to go.

Those dyes are corrosive. They formerly gnawed their way through equipment so fast it had to be replaced long before it should have been. And a lot of yarn was rejected because vats weren't entirely clean and one color ran into the other.

Now, Walter E. Knipe & Sons tell us there is no maintenance problem whatsoever. Colors come bright and true because there's no place on Enduro Stainless Steel for dyes to get a foothold. All equipment cleans sterile-clean. And it's easy to do. And that means savings all the way down the line.

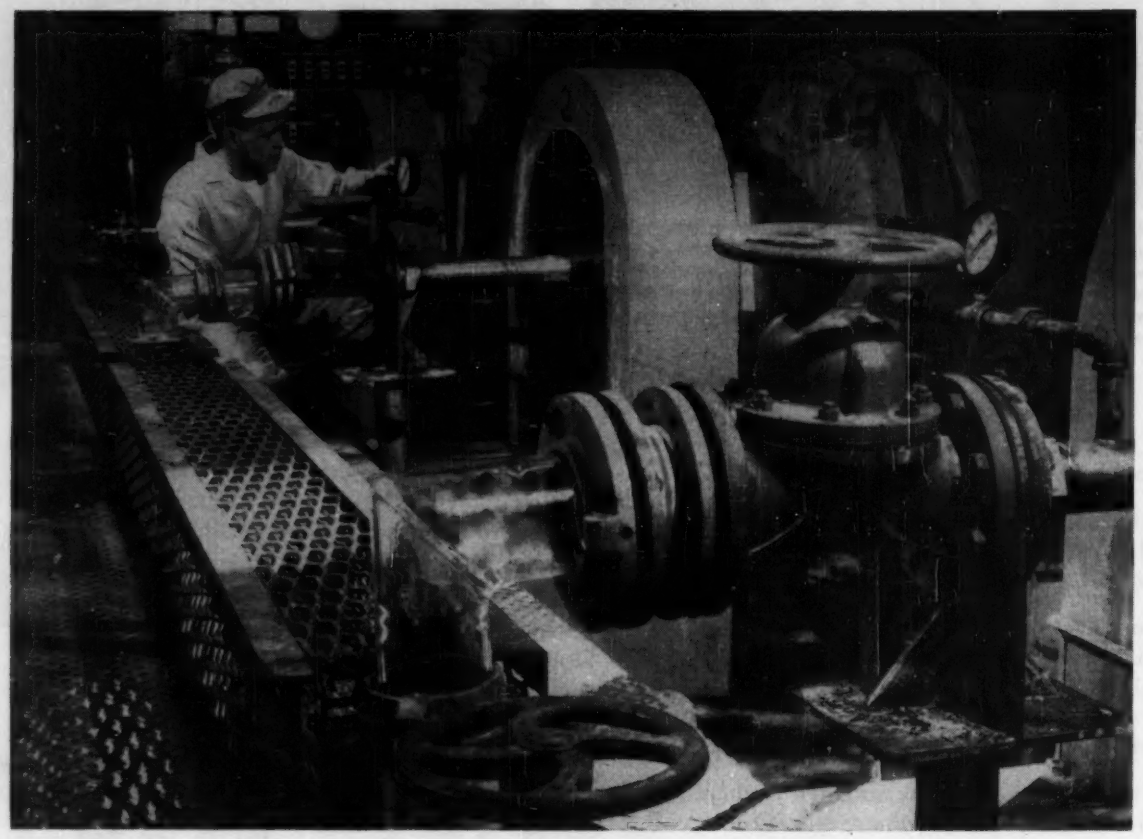
Whatever corrosion problem you may have, chances are Enduro Stainless Steel can help you solve it. And no matter what Enduro physical or chemical property you want most, you get the others automatically.

Republic pioneered the use of stainless steel. And all the experience we have is available to you. Just mail the coupon and let Republic do the rest.



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CONVERTER BEING PLATED internally by flow of a solution through the equipment. Deposit is even throughout.

Chemical Nickel Plating Comes to the Fore

Process equipment now being produced which has (1) cost advantages over solid nickel, and (2) performance advantages over electroplate.

Chemical nickel plating has just taken another big step forward. In a way, this is the most important step to date—for it means that the advantages of chemical nickel plating can now be passed on to the users of process equipment.

It took a company with extensive experience in the nickel plating of process equipment by electrolytic means to recognize the potentialities of chemical nickel plating, to establish pre-plating and post-plating procedures, and to provide the necessary production facilities. American Locomotive is the company, and Dunkirk, N. Y., is where chemically-plated converters, piping and other gaseous transmission equipment for the A.E.C. are already on the production line.

Advantages claimed are:

▶ **Uniform Thickness.** The process can be used to plate any surface, no matter how intricate, with uniform thickness. This is impossible with electrolytic nickel plating.

▶ **Zero Porosity** is guaranteed even in thin plating thicknesses of less than one mil.

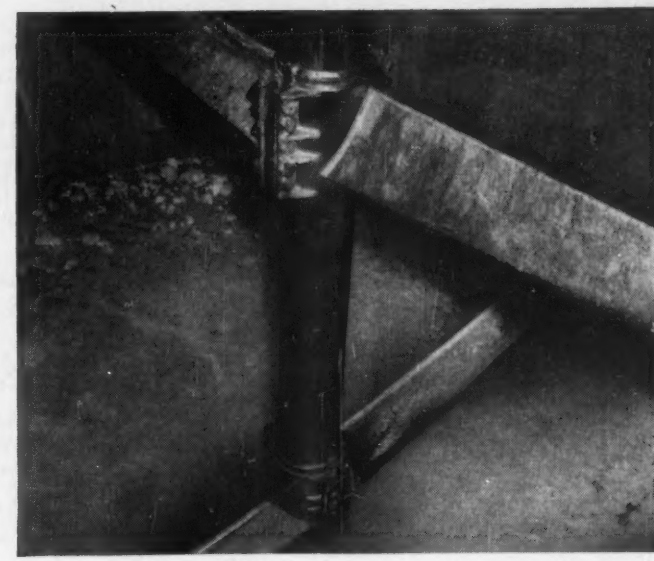
▶ **Excellent Adhesion.** The bond is intermolecular. Plated steel shows no spalling even when pulled to the yield point.

▶ **High Hardness.** Hardness averages about 500 Vickers or 49 Rockwell C, and can be increased by post-plating heat treatment to 950 Vickers or 63 Rockwell C.

These factors add up to a cost reduction opportunity for a company now using nickel for anti-contamination or corrosion resistance, where the corrosion rates are not too severe. In many instances where

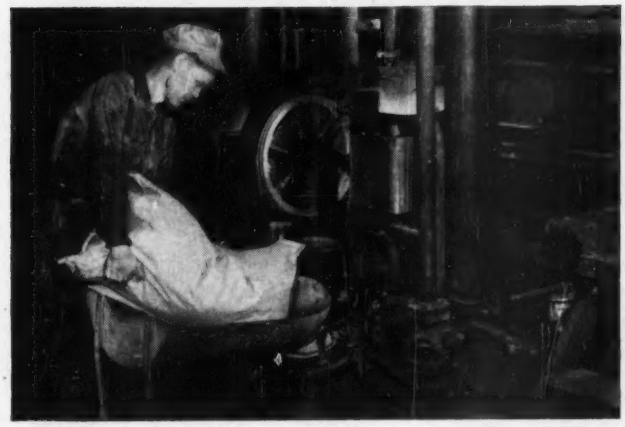
These Alloys Can Really Handle Hot Acids

SAVES $25,000 A YEAR—Agitator sweeps and shafts made of HASTELLOY alloy B mix a corrosive and erosive mineral slurry containing 6 to 80 per cent sulphuric acid. The alloy's corrosion resistance has resulted in a maintenance saving of $25,000 a year.





←SAVES $5,000 YEARLY—HASTELLOY alloy C charging baskets have decreased maintenance by 90 per cent on this job. They resist oxidizing and reducing conditions caused by acid salts in a solution of hot sulphuric acid.



←4 YEARS IN HOT H_2SO_4 AND HCl
Propellers, shafts, thermometer wells, and blow-off lines formerly used on this dye kettle had to be replaced every three months. HASTELLOY alloy D parts used in the same severe service are still good after four years.

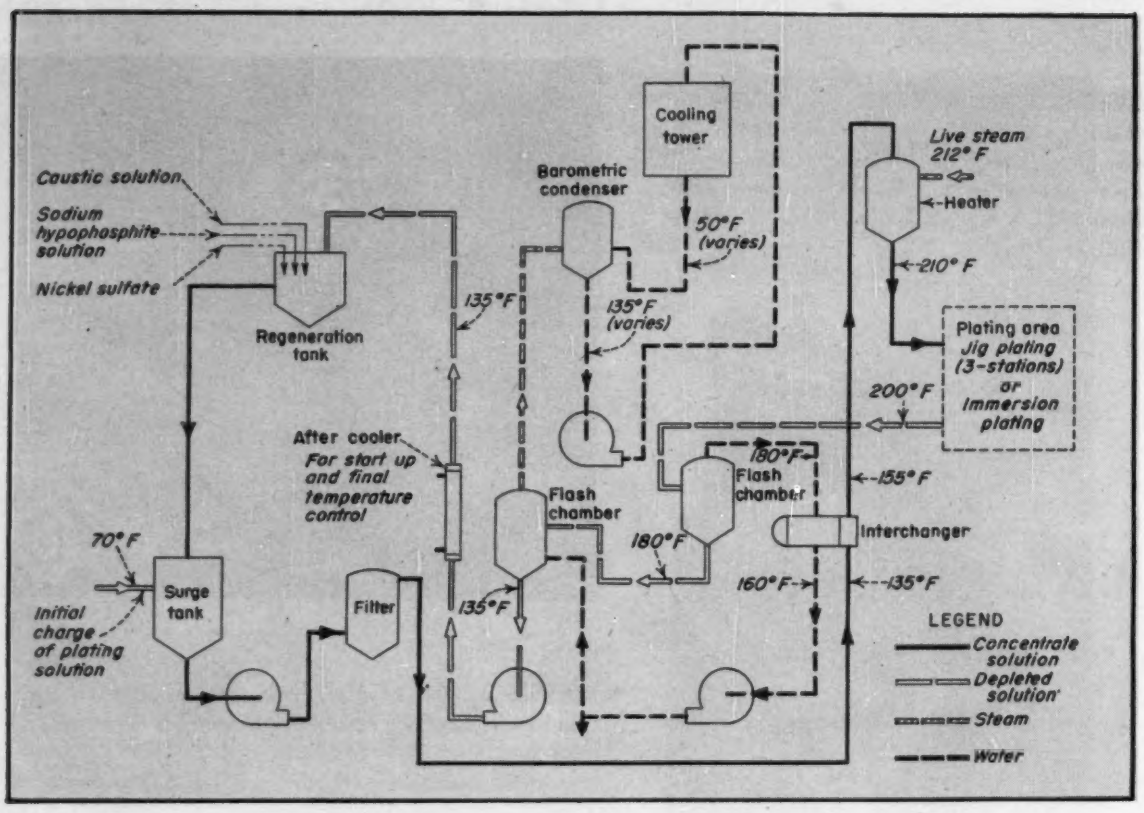
HASTELLOY *alloys can help solve your corrosion problems, too. For further information, contact the nearest Haynes Stellite Company office listed below.*

HASTELLOY *alloys*
TRADE-MARK

Nickel-base, corrosion-resistant alloys available as sheet, plate, bar stock, welding rod, welded tubing and pipe, cast pipe and pipe fittings, sand and precision-investment castings.

"Hastelloy" is a registered trade-mark of Union Carbide and Carbon Corporation.

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Los Angeles—New York—San Francisco—Tulsa



electroplated nickel equipment is now used, chemical nickel plating offers distinct advantages at roughly the same cost.

Early pioneering work with chemical nickel plating was done by the Bureau of Standards. Alco's process, called Alcoplate, is based on General American Transportation Corp.'s patents (their Kanigen process). Kanigen (derived from catalytic nickel generation) is "chemical deposition of a high-nickel, low-phosphorus alloy and the coating derived therefrom."

General American's first license went to Keystone Chromium Co. of Buffalo. The second went to Alco in May, 1954, while the first foreign license was granted to a French combine in Oct. 1954. General American has recently been nickel plating their tank cars by chemical means.

Two Plating Methods

The Dunkirk production facilities (see flowsheet) are designed for two continuous-flow methods of plating. First is a closed cycle system used for internal coating and for volume coating of similar-sized products—while the second is an immersion process for both internal and external coating and for plating product parts.

All equipment is lined with glass and linked with glass piping since the plating solution will deposit nickel on all but glass-like surfaces.

Plating is at a uniform rate—from 0.6 to 1.0 mils per hr. Composition of the plate is usually 93% nickel and 7% phosphorus.

How They Work

Products are immersed (after suitable surface pre-treatment) in a hot (180 F.) alkali cleaner for 10 min. Then they are rinsed in cold water and pickled for 10 min. in muriatic acid at room temperature. This is followed by a second rinse in water and a second immersion in the alkali cleaner. These operations are substantially the same as those performed prior to electroplating.

Chemicals for plating are mixed in 8-ft. diameter make-up tanks, using top-mounted motor-driven agitators. The solution is transferred through plastic pipe to the surge tank of the process loop. From the surge tank, the solution is pumped through a pre-heater into the main heater, where its temperature is raised to 215 F. It is then introduced into the work to be plated.

Plating takes place by catalytic reduction of nickel by sodium hypophosphite at the elevated temperature. From the product, the spent liquid passes through flash evaporators (used to drop the solution temperature rapidly and to remove accumulated condensate from the main heater) to the regeneration tank. Here, concentrated solutions of caustic, nickel sulfate and sodium hypophosphite (from chemical feed tanks) are introduced by an automatic proportioning pump to restore the solution to optimum concentration. The regenerated solution is then pumped back to the surge tank to complete the cycle.

At last!

A TRUE VINYL MASTIC!

Complete protection in a single coat—10 mils thick!

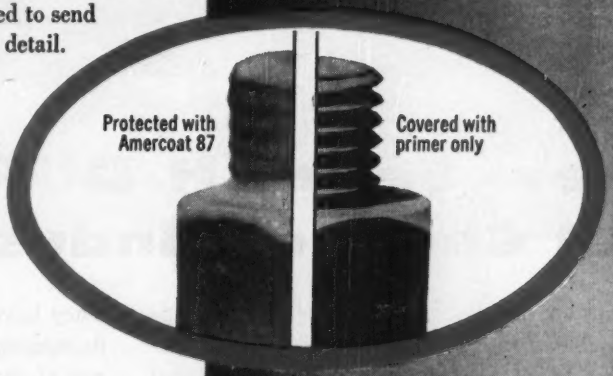
Amercoat No. 87 will cut your maintenance costs because one coat gives you the thickness and protection previously available only through the application of multiple coats.

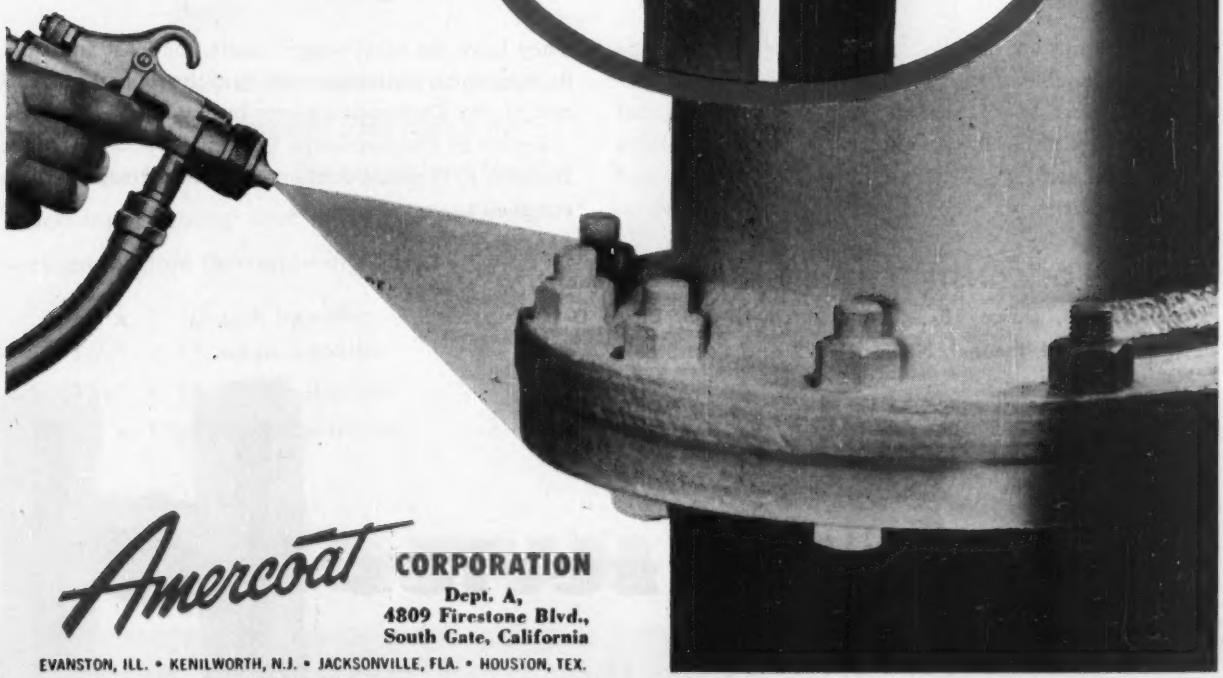
Amercoat No. 87 is the brand new solution to an old problem, for it combines the time-tested chemical and weather resistance of a vinyl with the extra thickness that was heretofore available only in conventional mastics.

Amercoat No. 87 is easily applied with standard industrial spray equipment. Only one cross-spray coat, over a primed surface, is required for complete protection. Because **Amercoat No. 87** is a true vinyl, it is not limited to black, but is available in a variety of colors.

You can save up to 50% of your labor costs with **Amercoat's new vinyl mastic No. 87.** We will be pleased to send you a bulletin describing this new coating in detail.

Notice the sharp bolt threads, welds and sharp corners are completely protected with one coat of Amercoat No. 87—10 mils thick!



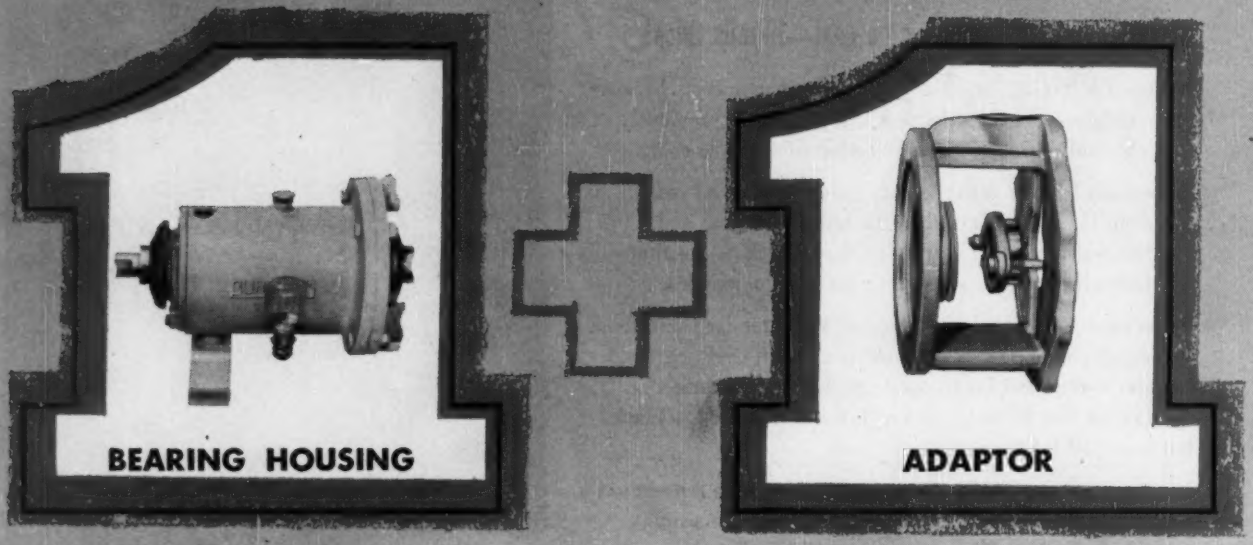


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New Series H DURCOPUMPS Meet Chemical Industry Demands

These pumps are designed to solve your tough pumping problems, and to meet your own special requirements. More adaptable than any previous chemical pumps, Series H Durcopumps are a new approach to chemicals handling. They are built for high heads and low capacities, as well as routine transfer services. They have the most rugged shaft, the least shaft deflection, the heaviest bearings, and the highest efficiencies of any Durcopumps ever built.

Series H Durcopumps are entirely new. Durco Bulletin P/8, which contains complete details, will be supplied to you on request.

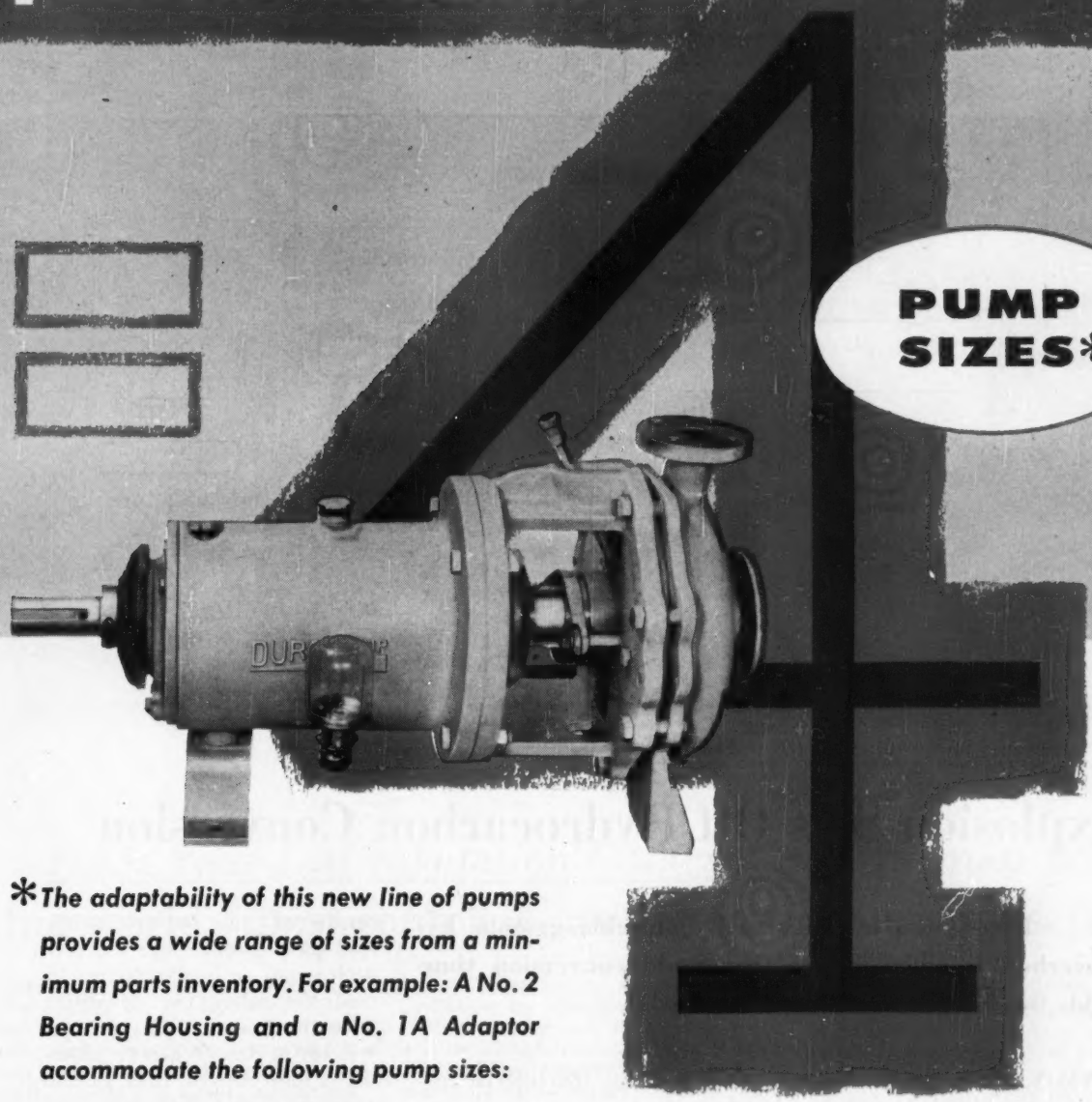
ALLOYS OF CONSTRUCTION. Durimet 20, Chlorimet 2, Chlorimet 3, Durco 18-8-S-Mo, Durco 18-8-S, Durco D-10, Monel, Nickel, Inconel, Ni-Resist #2 and Cast Steel.

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THE all new SERIES H DURCOPUMP

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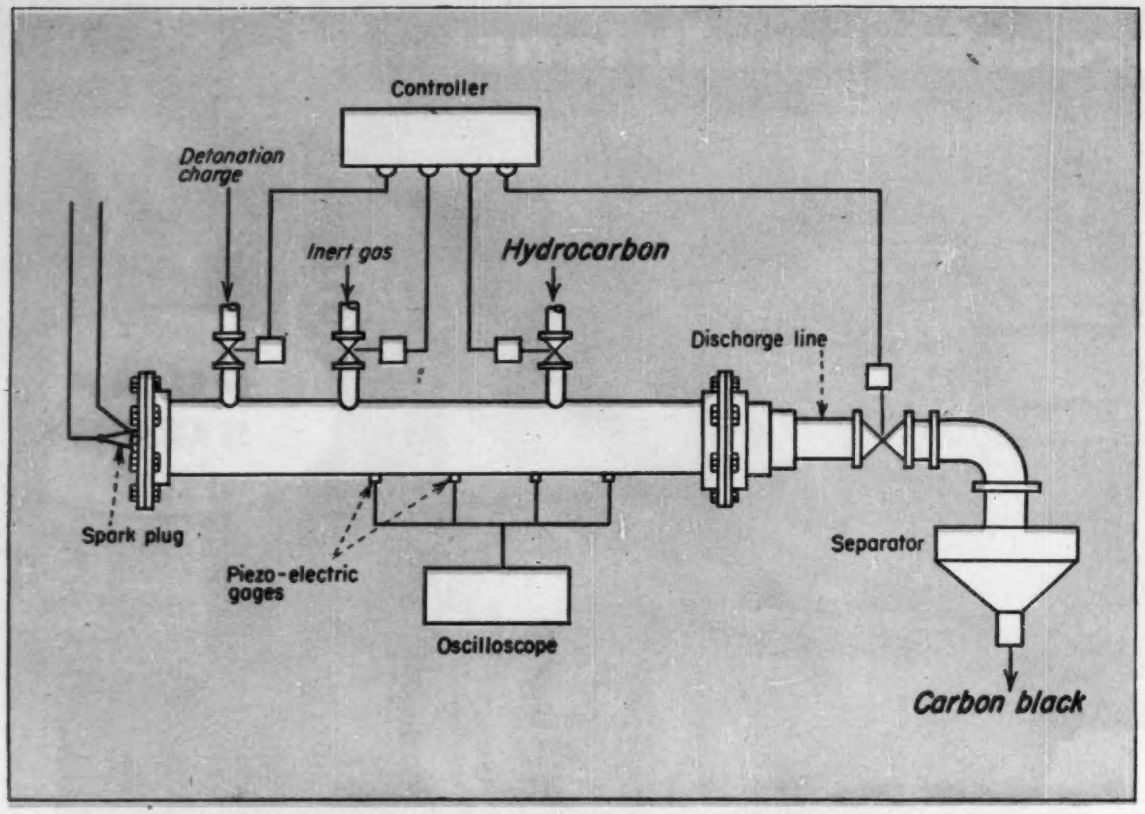
1" x 1" closed impeller
1½" x 1" open impeller
1½" x 1" closed impeller
2" x 1½" closed impeller

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 Melvin Nord, Chemical Engineer & Patent Attorney, Detroit, Mich.



Explosion Sets Off Hydrocarbon Conversion

Detonation of a thermally unstable gaseous hydrocarbon is added proof that rapid conversion time yields the finest, blackest carbon blacks.

What's the best way to produce the finest and blackest carbon black?

- Cut down the rate of particle growth.
- Decrease the conversion time.

And that's just what Godfrey L. Cabot does in its novel detonation process.

By passing a detonation wave—at velocities greater than the speed of sound—through a gaseous suspension of a hydrocarbon, Cabot produces a fine carbon black in a fraction of the conventional conversion time.

▶ **Simple Set-Up**—The reaction is carried out in a horizontal chamber of any convenient length and cross section. A plate—drilled and tapped for a spark plug—covers one end of the reactor. The other end hooks up to a discharge line which, in turn, connects with an off-take pipe leading to a carbon black separator.

With the discharge valve closed, detonation charge, inert carrier gas and feed gas are pumped into the reactor via three separate inlets. And piezo-electric gages are connected into an oscilloscope to record the velocity of detonation wave travel.

▶ **Ready to Run**—When the chamber is fully charged, three gaseous zones are present: detonation, inert and feed. The smallest of these is the inert gas—acting as a barrier between the detonation charge and feed gas.

After charging, inlet valves are closed, the spark plug is excited and the discharge valve is opened. Then combustion gases and carbon black flow out of the reactor, into the separator.

▶ **Preferred Pressures**—Since the reaction is independent of pressure, the reactor can be run at either



Meet the man you can call with confidence to solve your thermal insulation problems



To insulate outdoor tanks with complete weather protection, these skilled J-M applicators follow a specification developed by Johns-Manville. Here they are fastening J-M Asbestocite* Sheets over J-M Zerolite* Insulation. J-M 85% Magnesia Insulation is also widely used for this type of equipment

He is your J-M Insulation Contractor... the man with the world's most complete insulation engineering service

"Insulation is no better than the man who applies it." Today, with rising fuel and maintenance costs, it is especially important to place your insulation job in skilled hands. The scientific application of J-M quality insulations by J-M Insulation Contractors will assure you of the maximum return on your insulation investment for years to come. Moreover, you get undivided responsibility for *all* your insulation requirements.

1. You get dependable materials—Johns-Manville manufactures a complete line of insulations for every service temperature from minus 400F to plus 3000F. From them your J-M Insulation Contractor can select the right insulation for the most dependable service on your job. To develop new and improved insulation materials Johns-Manville maintains the J-M Research Center—largest laboratory of its kind in the world.

2. You get dependable engineering—For 95 years Johns-Manville has been accumulating insulation engineering experience. J-M Insulation Engineers are called upon to solve insulation problems of every type and magnitude, in every industry. Since your J-M Insulation Contractor works closely with J-M Insulation Engineers, he brings to *every* job a high degree of training, skill and experience.

3. You get dependable application—Johns-Manville has set up a nationwide organization of J-M Insulation Contractors to serve you. These Contractors maintain staffs of insulation engineers as well as skilled mechanics thoroughly trained in J-M's proved application methods. You can have absolute confidence in their ability to apply J-M insulations correctly for trouble-free performance.

For further information and the name of your J-M Insulation Contractor, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ont.

*Reg. U. S. Pat. Off.

Johns-Manville *FIRST IN* INSULATION

MATERIALS • ENGINEERING • APPLICATION

elevated or reduced pressures. But—to facilitate removal of the product—it's best to run the carbon black recovery system under vacuum.

▶ **Choice of Hydrocarbon**—The only criterion in selecting the proper feed gas is thermodynamic instability. Any hydrocarbon capable of sustaining a detonation wave can be used. The hydrocarbon's ignition or flammability limits do not—in any way—restrict the reaction's progress.

If enough oxygen-containing gas is added to the more stable hydrocarbons, they too can be used as feed. However, the ratio of oxygen to carbon atoms should be less than one. Larger ratios may yield no carbon at all.

The new process yields a fine, black product having a notably low electrical resistivity. Physical data are cited in the patent and are compared with those of standard carbon blacks.—**U. S. 2,690,960 by George B. Kistiakowsky, George D. Halsey, Jr., Murray E. Malin and Herbert T. Knight to Godfrey L. Cabot, Inc.**

Two-in-One Oil Extraction

Pre-drying of raw material goes by the boards in this new process for extracting oil from cottonseed, flax, soybeans, etc. Instead, the drying and extraction are combined in a single operation.

This is how it's done.

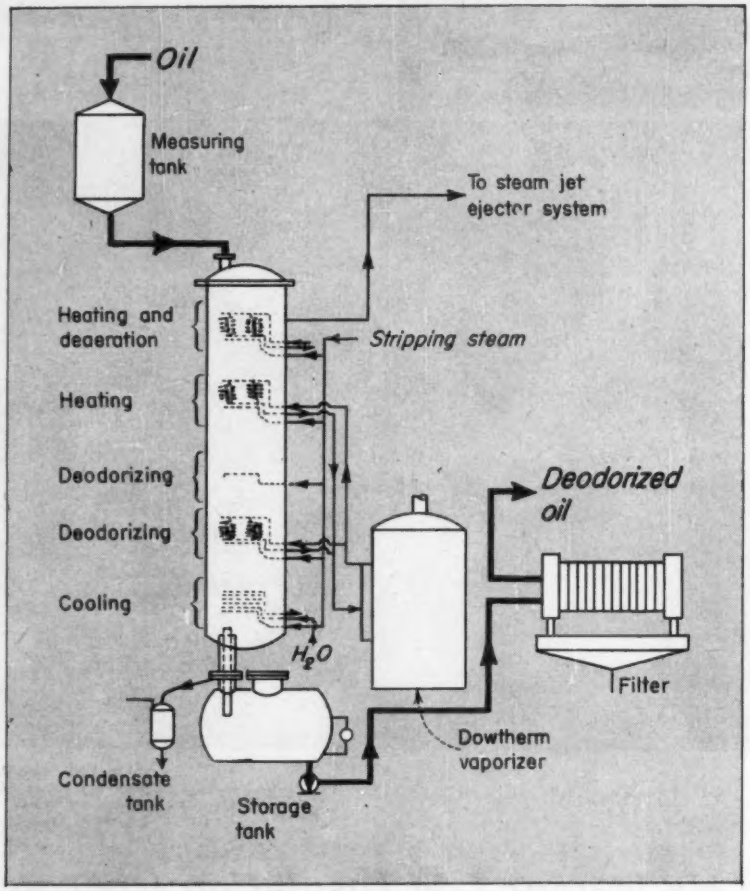
▶ **Azeotrope Formed**—Hot solvent vapors do a two-fold job. They:

- Dry the raw material—by forming an azeotrope with the water in the seeds.
- Extract oil from the seeds.

The water-solvent azeotrope—along with excess solvent vapors—leaves the column as overhead, going first to a condenser, then to a separator. Condensed solvent is recycled to the system.

▶ **And Oil Extracted**—Hot, water-free vapors diffuse down through the seeds. Weak miscella is recycled to the top of the extractor; concentrated miscella goes to an evaporator. Solvent—recovered in the evaporator—goes to a superheater, then is recycled to the top of the extracting column.

The inventor describes, but does not claim, equipment used in carrying out the process.—**U. S. 2,695,304 by Roy W. Barns to The French Oil Mill Machinery Co.**



Oils Deodorized in Multi-Stage Column

Semi-continuous deodorization of fatty oils is stepped up in this novel column consisting of five trays or zones:

- Deaerating and heating.
- Heating.
- Deodorizing.
- Deodorizing.
- Cooling.

Baffles—atop each tray—play a dual role. They (1) provide a tortuous path for escaping vapors and splattering oil thrown up from the trays and (2) connect the trays with the evacuated column.

▶ **Typical Installation**—For a clear picture of how the equipment works, let's take a look at a typical run of 2,500 lb. of cottonseed oil.

Before any oil enters the column, the steam ejector system is put into operation. And the column is evacuated to a pressure of about 6 mm. Hg.

Then oil is transferred from the

To get any patents, including those mentioned here, order from the Commissioner of Patents, Washington 25, D. C. Each patent costs 25 cents.

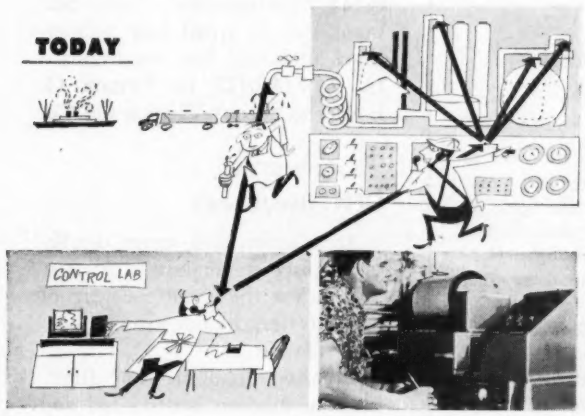
Advertisement of **THE PERKIN ELMER CORPORATION**

Analysis Moves from Lab to Line

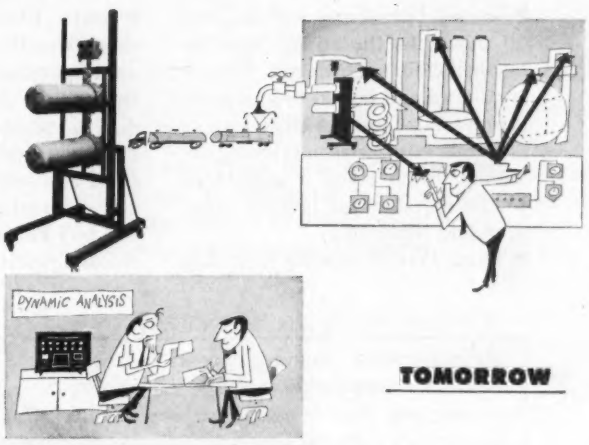
The pride of the automation proponents is the chemical processing plant. Carloads of materials flow through its complex network of pipes into gleaming fractionation columns, purification towers and reactors with a minimum of human attention. Equally large amounts of finished product flow outward without ever having been seen by human eyes.

This complex system functions smoothly thanks to the hundreds of control instruments in any processing plant. They control material flow, they provide the correct temperature and pressure to produce the highest product yield. These plants represent our closest approach to the automatic factory.

But in this system there are flaws. For even when all dials and gages are functioning correctly, the product yield in terms of quality and quantity may be completely awry. These instruments will not indicate changes in raw material composition, catalyst contamination, or loss of efficiency in a scrubbing tower. Present-day instruments indicate only the process stream environment, not the composition of the process itself. Only the control laboratory is able to give us an accurate picture of the product and its composition as it moves through the plant. Subtle deviations in the product can be spotted and analyzed, and from the control laboratory instructions can be forwarded to process areas prescribing changes in control instrument settings. Thus, true control in today's processing begins in the analytical laboratory.



But efficient as they are, control laboratories still represent a bottleneck in the processing chain. It takes time to move a sample to the laboratory, analyze it, and relay findings back to the plant. Meanwhile, vast quantities of product may have moved through the processing units.



An obvious solution is to move the laboratory to the problem, i.e., tie an analytical instrument like the infrared spectrometer directly into the process stream where it can produce continuous and instantaneous data. Instruments capable of providing such "on-stream analytical control" are just beginning to appear. They will not replace existing environmental controllers but they do provide the means for automatically controlling these instruments to meet changing process stream conditions. They close the loop between the product and the process stream environment in which it is produced.

Two such on-stream analyzers are already in production by Perkin-Elmer and are being used in the field. Known as the Bichromator and Tri-Non Analyzers, each has its use depending upon the particular problem to be solved. While the most obvious application for such analyzers is to monitor the finished product, in a complicated chemical process where there are many variables, end point analysis does not provide sufficient control information. Hence, it is found advisable to install instruments at several critical points in the process. Such analyzers will soon make true automation a reality in chemical processing.

Digest of an article from *Control Engineering*, Oct., 1954.
Reprints available from Perkin-Elmer on request.

THE PERKIN-ELMER CORPORATION, NORWALK, CONN.
First in Analytical Control

measuring tank to the first tray–for one-half hour's treatment. During this time, the oil is heated to 320 F. (below the effective deodorization temperature), steam stripped and deaerated. Stripping steam and air go off into the shell's vacuum zone, then out through a vacuum connection.

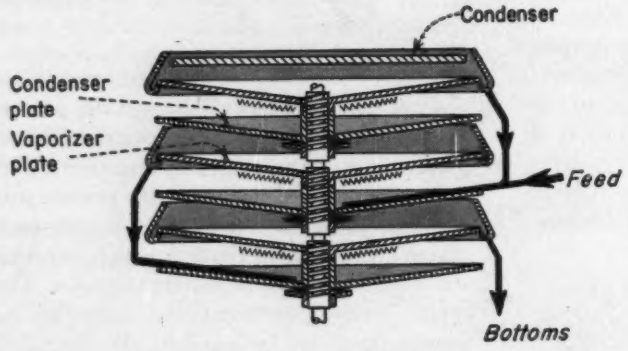
▶**Second Tray**–From tray #1, the oil moves to the second tray for one-half hour's treatment. Here it is stripped and heated to a deodorization temperature of 460 F.

While this treatment is going on, another batch of oil is introduced to the first tray for heating, stripping and deaeration.

▶**Third Tray**–Following treatment in tray #2, oil passes to the third tray where it is deodorized–by steam stripping.

Drop valves are then opened to deliver the batch from one tray to the next. And the process is continually repeated–oil going to tray #4 (deodorizing) and finally to tray #5 (cooling).

▶**Unit's Efficiency**–The inventor claims that the baffles atop the trays are responsible for the unit's effective use of stripping steam. Only 4.5 lb. of steam per 100 lb. of deodorized oil are required in most cases as compared with 25 lb. in conventional equipment.–**U. S. 2,691,665 by Alton E. Bailey to National Cylinder Gas Co.**



Refluxing Simulated in Molecular Still

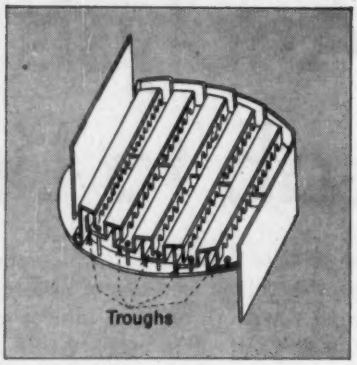
Borrowing from conventional still operation, this new molecular still makes use of a refluxing action–to effectively separate heat-sensitive compounds.

Although the still can be made up of any number of sections, only three are shown. Each consists of a vaporizer plate, condenser plate and feed screw. Vaporizing plates are mounted on and rotate with the central shaft; condensing plates are stationary.

Feed, continuously flowing into the bottom of the middle screw, is raised to the middle vaporizing plate. Liquid is thrown out–centrifugally–on this plate in a thin film and is partially vaporized.

The vaporized portion (1) condenses on the cold condenser plate immediately above and (2) runs down the underside of the plate to the bottom of the upper feed screw. The screw then raises the liquid to the upper vaporizing plate (in this case, the rectifying section). Here part of the liquid vaporizes, then condenses (as volatile product) on the top condenser. Residual liquid –equivalent to reflux in a conventional still–returns to the feed plate.

Unvaporized liquid on the middle vaporizing plate runs down to the bottom feed screw and is lifted to the lowest vaporizing plate (the stripping section). The more volatile constituents vaporize and condense on the condenser plate immediately above. Condensed liquid is recycled to the feed plate. Residue on the vaporizing plate is withdrawn as stripped bottom product.–U. S. 2,694,675 by Walter H. Hogan.



Competition for Bubble Cap Trays

For something new and different in fractionating trays, take a look at this–a tray made up of stepwise troughs.

And compare these features with those of the conventional bubble cap tray:

- Simpler and cheaper fabrication–from thin, lightweight, corrosion-resistant metals.
- Easier assembly and maintenance.
- Greater riser area–25-30% compared with the conventional 6-15%.
- More efficient contact between countercurrent liquid and vapor–due to equal slot submergence under all flow conditions.–**U. S. 2,692,128 by Vernon O. Bowles to Socony-Vacuum Oil Co.**

Shortcut to BHC Recovery

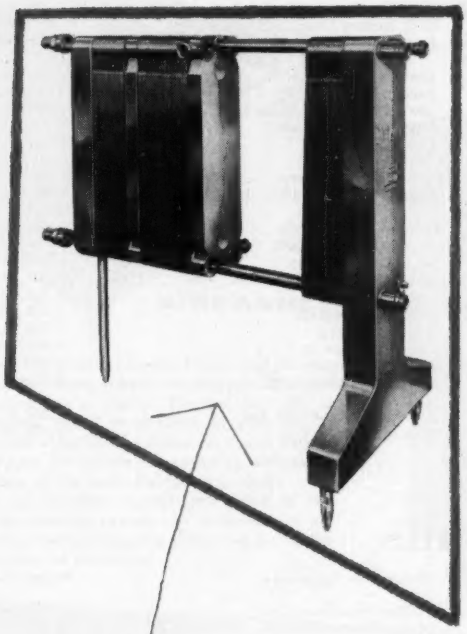
Atomization and steam distillation replace evaporation in this new process for the rapid recovery of benzene hexachloride from a benzene solution.

▶**Atomized Solution**–The BHC-benzene solution is atomized and intimately mixed with steam in an aspirator atop a vaporizing chamber.

Overhead vapors–benzene and steam–flow to a condenser, then to a separator. And condensed solvent is recycled to the benzene chlorinator.

Benzene-free BHC particles–settling to the bottom of the vaporizer –are recovered in a water slurry.–**U. S. 2,691,625 by John T. Clarke to Ethyl Corp.**

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HIGH THERMAL EFFICIENCY?

In De Laval Plate Heat Exchangers the plates are so designed as to produce strong turbulence and high velocity . . . achieving maximum heat transfer.

HIGH PRESSURE RESISTANCE?

De Laval Heat Exchanger plates are made of heavier gauge stainless steel than ordinarily used . . . plate throats are pressed to provide greater strength . . . internal stress in plates is minimized by design.

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Cap nuts on tightening bars are fitted with thrust ball bearings and thrust washers . . . clearly stamped indicating marks make it easy to tighten to same tension each day.

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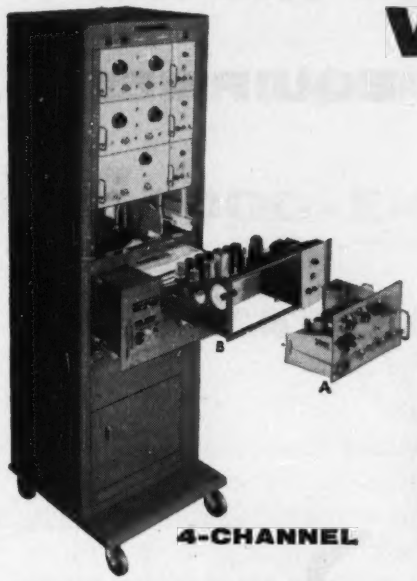
Your Checklist of New Equipment Patents

Operation . . .	About . . .	Inventor or Assignee . . .	Patent No. . .
Adsorption	Fractionation of hydrocarbon gases by solid adsorbents	Standard Oil Development Co	2,693,865
	Continuous adsorber	Union Oil Co. of Calif.	2,694,605
Chemical reaction	Lime hydrator	Azbe Corp.	2,694,000
Crushing and grinding	Rotating and vibrating units in balanced ball mill system	Vibro Dynamic Engineering, Inc	2,693,320
Distillation	Tray design	Edw. G. Ragatz Co.	2,693,350
	Gas-liquid contacter	Koch Engineering Co. Inc.	2,693,949
Extrusion and molding	Molding unvulcanized rubber	U. S. Rubber Co.	2,693,007
	Continuously operating screw press for plastics	Joseph Eck & Sohne	2,693,348
	Shaping sheets of acetyl-containing cellulose acetate	Eastman Kodak Co.	2,694,227
	Molding ceramics	Bendix Aviation Corp.	2,694,245
Filtration	Backwash filter	Olson Filtration Engineers, Inc.	2,693,882
Fluid and particle flow	Granular solids conveyor	Union Oil Co. of Calif.	2,693,395
	Resilient-tube rotary pump	Leon A. Seyler	2,693,766
	Lifting fluent solids in hydrocarbon conversion systems	Houdry Process Corp.	2,694,036
	Apparatus for solid transfer	Socony-Vacuum Oil Co., Inc	2,694,039
	Disengager for separating granular solids from lift gas	Houdry Process Corp	2,695,197
	Handling granular solids	Union Oil Co. of Calif.	2,695,212
Heat transfer	Liquid heater	Lars K. H. Petersen	2,693,346
	Heat exchanger construction	Modine Manufacturing Co.	2,693,636
	Shell-and-tube heat exchanger	Gulf Oil Corp.	2,693,942
Liquid-liquid separation	Emulsion separator	Otto B. Schoenfeld	2,693,880
Mixing	Liquid-siren sonic agitator	Ultrasonic Corp	2,693,943–4
Screening	Sieve calibration	Sec. of Commerce	2,693,706
Solid-gas separation	Electrical precipitator	Research Corp	2,694,464
Solid-liiquid separation	Separating dust from liquids	Herbert Simpson Corp	2,693,946
Solid-solid separation	Flotation of talc from ore containing metal values	Sheritt Gordon Mines Ltd.	2,693,877
	Raw coal separation via sink-float method	Stamicarbon N. V.	2,693,878

. . . And New Process Patents

Product . . .	Process . . .	Inventor or Assignee . . .	Patent No. . .
Carbon	Feed preparation for furnace black production	Phillips Petroleum Co.	2,693,441
	Carbon black manufacture	Michael Steinschlaeger	2,694,621
Catalysts	Conditioning metal oxide catalysts	Socony-Vacuum Oil Co., Inc	2,693,481
	Regenerating granular contact material	Socony-Vacuum Oil Co., Inc.	2,695,266
Fats and oils	Continuous refining of fatty oils with an inorganic acid	Aktiebolaget Separator	2,694,082
Fuels	Gas manufacture	The Aerogen Co. Ltd.	2,693,947
	Coke manufacture	Phillips Petroleum Co.	2,694,038
	Water gas enrichment	Standard Oil Development Co.	2,694,623
	Underground gasification of coal	Stanolind Oil & Gas Co	2,695,163
Gases	Electrolytic production of fluorine	Imperial Chemical Industries Ltd.	2,693,445
	Eliminating O_2 from gases	De Directie van de Staatsmijnen du Limburg	2,693,446
	H_2S production	National Container Corp.	2,694,619
Hydrocarbons	Separating benzene from nonaromatics by adsorption	Standard Oil Development Co	2,693,495
	Shale oil production	Shell Development Co	2,694,037
	Separation of naphthenes from a saturated hydrocarbon mixture—using methanol and water	Phillips Petroleum Co.	2,695,322
Inorganic chemicals	Transporting wet ammonia-soda crystals	Diamond Alkali Co.	2,693,403
	Hydrogen peroxide manufacture	Imperial Chemical Industries Ltd.	2,693,998
	Engine generation of feed gas for ammonia synthesis	The Texas Co.	2,694,003
	Magnesia recovery	Canadian Refractories Ltd.	2,694,620
	Preparation of alkyl hypochlorites	Bjorksten Research Laboratories, Inc	2,694,722
	Operating a nitrogen fixation furnace	Food Machinery & Chem cal Corp.	2,695,216
	Hydrogen peroxide purification	Shell Development Co.	2,695,217
Metals and ores	Separating copper values from an ammoniacal solution	Sheritt Gordon Mines Ltd.	2,693,404–5
	Electrodeposition of chromium and its alloys	Batelle Development Corp.	2,693,444
	Separating metallic nickel and cobalt from acidic solutions	The Chemical Construction Corp.	2,694,005–6
	Titranium production	Chilean Nitrate Sales Corp	2,694,652–4
Organic chemicals	Converting ethylene or propylene to solid polymers	Standard Oil Co. (Ind.)	2,691,647
	Maleic anhydride preparation	E. I. du Pont de Nemours & Co.	2,691,660
	Preparing acetals	The Dow Chemical Co.	2,691,684–5
	Isopentane preparation	Sun Oil Co.	2,691,688
	Catalytic reduction of CO_2 with H_2	Rheinpreussen A. G. fur Bergbau und Chemie	2,692,274
	Acrylonitrile manufacture	Ciba Ltd.	2,692,276
	Benzene sulfonation	Union Carbide and Carbon Corp.	2,692,279
	Catalytic dealkylation of aromatic hydrocarbons	Houdry Process Corp.	2,692,293
	Producing CS_2 in an electric shaft furnace	Eduard Halm	2,692,817
	Benzene hexachloride production	Columbia-Southern Chemical Corp.	2,692,900
	Oxidation of olefins	Chempatents, Inc	2,693,474
	Preparing oxalic acid esters	Pittsburgh Plate Glass Co	2,693,478
	Preparation of organic sulfates and sulfonates	Colgate-Palmolive Co.	2,693,479
	Monosulfonation of benzene	Monsanto Chemical Co.	2,693,487
	Chlorobromomethane preparation	Stop-Fire, Inc.	2,694,094
	Alkylating aromatic hydrocarbons	American Cyanamid Co.	2,694,095
	Suspension polymerization	Peter L. Shanta	2,694,700

WHICH "150" fits your oscillographic recording need?



4-CHANNEL

As a graphic example of the design idea that has brought new versatility to industrial recording, a Carrier Preamplifier (A) is shown above in position to plug into a Driver Amplifier in framework with Power Supply (B) which are normally already in place in the Basic Cabinet Assembly.

The identical design principles of the four-channel system are provided in the two-channel, the only difference being the number of channels.

Sanborn "150" Recording Systems that put to use the original design concept of amplifier interchangeability (illustrated at the left) start with either a four-channel or two-channel standard Basic Assembly, to which the user adds whatever selection or combination of preamplifiers (A) are needed for his recording problem. The standard Basic Assemblies comprise a metal Cabinet, Recorder, and a built-in Driver Amplifier and Power Supply (B) for EACH channel. Presently available Preamplifiers are: AC-DC, Carrier, DC Coupling, Servo Monitor, Log-Audio, and Low Level Chopper.

Advantages common to ALL Sanborn Recorders are: inkless recording (by heated stylus) on plastic coated strip chart paper, and in true rectangular coordinates . . . high torque galvanometer movement . . . time and code markers . . . numerous paper travel speeds.



2-CHANNEL

"150"

COMPLETE FOUR-CHANNEL SYSTEM FOR USE WITH ANALOG COMPUTERS

This "150" system consists of a Cabinet Assembly, a four-channel Recorder, and *two* dual channel DC Amplifiers. Each amplifier is complete with a common power supply. Each measures and records two separate single-ended signals, at sensitivities between one and one hundred volts per centimeter. The *two*-channel version of this system will comprise Cabinet, *two*-channel Recorder, and *one* dual channel amplifier.

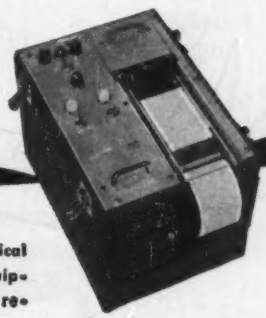


Brief details also available on "150" SIX AND EIGHT CHANNEL SYSTEMS

"150"

SINGLE-CHANNEL RECORDER

A compact, lightweight unit for use when only one channel is required — provides permanent, inkless recording in *true* rectangular co-ordinates; *five* paper speeds (5, 10, 25, 50, 100 mm/sec.); *extra* stylus for either manual or remote timing and coding marks. Designed for simple, patch cord connection to *any* of the several "150" preamplifiers (plus driver amplifier and power supply), available soon in portable metal cases.



Catalog and technical data on all "150" equipment available on request.

SANBORN COMPANY

Industrial Division

CAMBRIDGE 39, MASS.

WHEN YOU'RE UP IN THE AIR

OVER PROCESS EQUIPMENT...



THE ANSWER IS

KELLOGG-ENGINEERED

FABRICATION

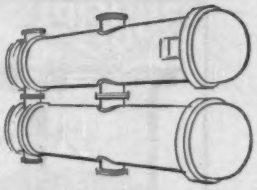
We emphasize "engineered" because M. W. Kellogg means much more than just putting together heat exchangers, pressure vessels, piping and other process equipment. Backed by a complete metallurgical and welding research staff, Kellogg process equipment is designed and fabricated by men who are recognized authorities in the field of heat transfer, stress analysis, welding techniques, non-destructive testing—and who constantly keep up with what is happening for tomorrow.

You can save many precious man-hours for your own engineers with Kellogg-engineered process equipment. You can assign the design problem to Kellogg or have Kellogg review your own design engineering to assure an optimum design. Your engineers will find it stimulating and profitable to work with the Kellogg staff.

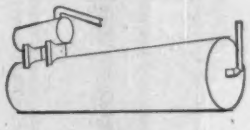
Kellogg process equipment means top performance at minimum investment and prompt deliveries. It is engineered for the job by engineers who *know* their jobs. If recently you have not had firsthand experience with the Kellogg Fabricated Products Division, we would welcome the opportunity to describe our expanded services and manufacturing facilities.

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HEAT TRANSFER EQUIPMENT



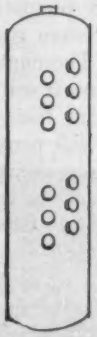
TANKS AND REACTORS



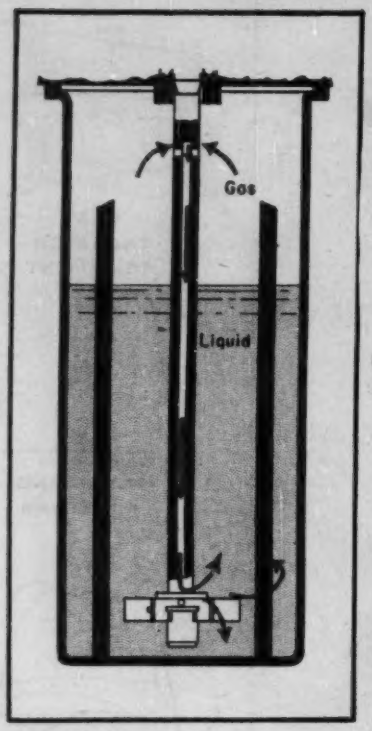
KNOCKDOWN VESSELS



PROCESS PIPING



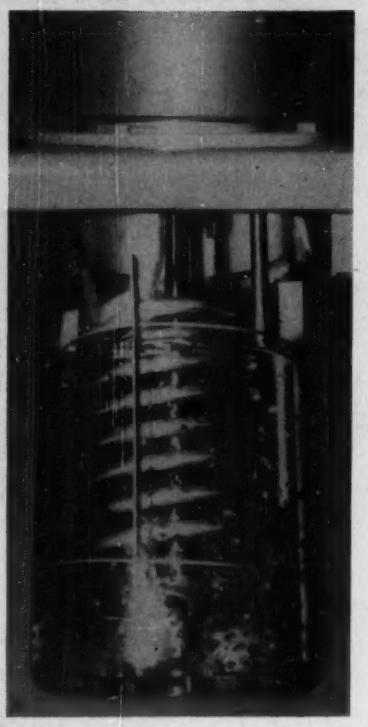
PRESSURE VESSELS



Gas through shaft gives . . .



Faster reaction than . . .



Standard agitator model.

Gas Disperser Upgrades Pressure Reactions

MAYBE you've been looking for a way to improve autoclave performance. Reaction time is too long, or pressure too high for economical operation.

If so, you'll welcome newly disclosed details of the Dispersimax agitator. Design for pilot plant and laboratory high-pressure autoclaves it's claimed vastly superior for promoting chemical reactions between gases, liquids and solids.

Thorough and exhaustive tests show it will decrease reaction times many fold. In a great many cases it will permit lower reaction pressures, pointing to lower costs for plant-size equipment.

▶**Gas Charge**—Dispersimax promotes reactions by actually forcing small bubbles of gas at high velocity into and throughout the catalyst-carrying liquid. This action greatly increases interfacial contact between gas, liquid and catalyst. Comparison with the action of a conventional turbulence agitator is shown above.

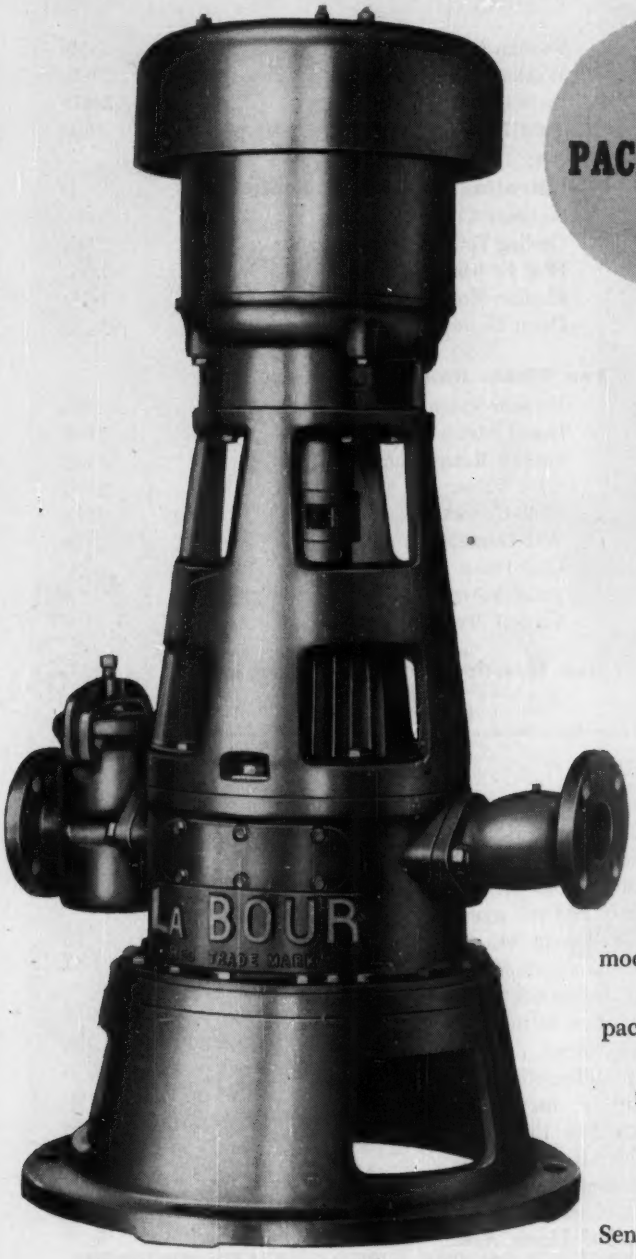
Dispersimax achieves greater interfacial contact between gas, liquid and catalyst by: a.) drawing the gas through a hollow rotary shaft and dispersing it into the liquid in the form of small bubbles and b.) by distributing the bubbles throughout the liquid by both circumferential and vertical circulation.

These two actions, bubbling and circulation, are produced mechanically by a hollow rotating shaft having radial impeller blades at its lower end. Gas enters the hollow shaft through small holes drilled near the top above the liquid level. It leaves through similar holes between the impeller blades below the liquid level.

▶**Rotation and Suction**—When the shaft is rotated at speeds up to 650 rpm. the impeller blades create a suction in the vicinity of the holes between the blades. This low pressure zone draws gas through the shaft holes above the liquid, down through the shaft and into the liquid at the bottom of the vessel.

The rotating impeller circulates the bubbles rapidly in a circumferential pattern. As the bubbles strike the baffles adjacent to the side walls of the vessel they are deflected vertically upward and downward. Suspended particles of catalyst follow a similar circulation pattern to remain thoroughly dispersed.—**Autoclave Engineers, Inc., 860 East 19th St., Erie, Pa.**

for Flooded Suction or Suction Lift



It's PACKINGLESS

It's SELF PRIMING

It's CENTRIFUGAL

It's LABOUR

The new Type CG LaBour is an improved model, operating under positive or negative suction lift conditions as required. It has no packing or close fitting parts in contact with the liquid. The open end of the dynamic seal need not be exposed to atmosphere, so escape of volatile or toxic gases may be prevented. The seal can be flushed during normal operation if desired.

Send for your copy of Bulletin G-1, which gives complete details.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.

Equipment on these pages made news this month . . .

Equipment Cost Indexes, p. 240

Page number is also Reader Service code number

New Processing Equipment

Autoclave Agitator 236A
On-Stream Blender 238A
Crusher 238B

New Materials of Construction

Insulation Weatherproofing 240A
Cellular Concrete 240B
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New Instruments & Controls

Thermostatic Controller 242A
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New Maintenance Tools & Supplies

Rupture-Proof Gasket 246A
Vacuum Grease 246B
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Portable X-Ray 246D
Tube Plug 246E

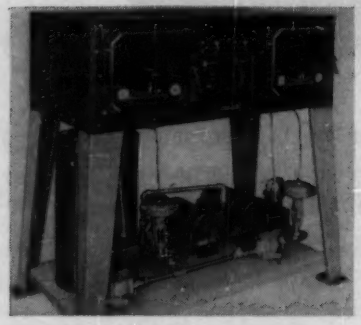
New Heating & Cooling Equipment

Sectional Condensers 248A
Cooling Tower Fan 248B
Heat Exchangers 248C
Flexible Heaters 248D
Drum Heaters 248E

New Fluids Handling Equipment

Vacuum Pump 250A
Liquid Metals Pump 250B
Positive Rotary Pump 250C
Alloy Valves 250D
Multi-Cyclone 252A
Wet Dust Collector 252B
Gear Pump 252C
Relief Valve 252D
Vertical Turbine Pump 252E

. . . For more details, use Reader Service Card on page 443



On-Stream Blender

Continuously delivers uniformly-blended product.

The Two-Component Blender is a simplified, standardized unit that comes as a packaged machine for on-stream blending operations. It lowers cost by eliminating tank storage, mechanical mixing, stratification and human errors inherent in manual batch blending. It's recommended for caustic dilution, asphalt blending, cutting of heavy fuel oil and blending of butane and gasoline.

Two types are available: a flow-responsive blender that varies its output automatically to process demand; and a controlled-rate blender that has rate control and will maintain a preset blend rate exactly and, with proper arrangement of meters, do this independent of changes in composition to match a given process requirement.

Blender has a differential gear that synchronizes a mechanical drive system with flow through a meter. Desired blends may be duplicated with accurate uniformity for any number of batches.—**Proportioneers, Inc., 345 Harris Ave., Providence, R. I.** 238A

For More Information . . .



about any item in this department, circle its code number on the Reader Service Postcard inside the back cover.

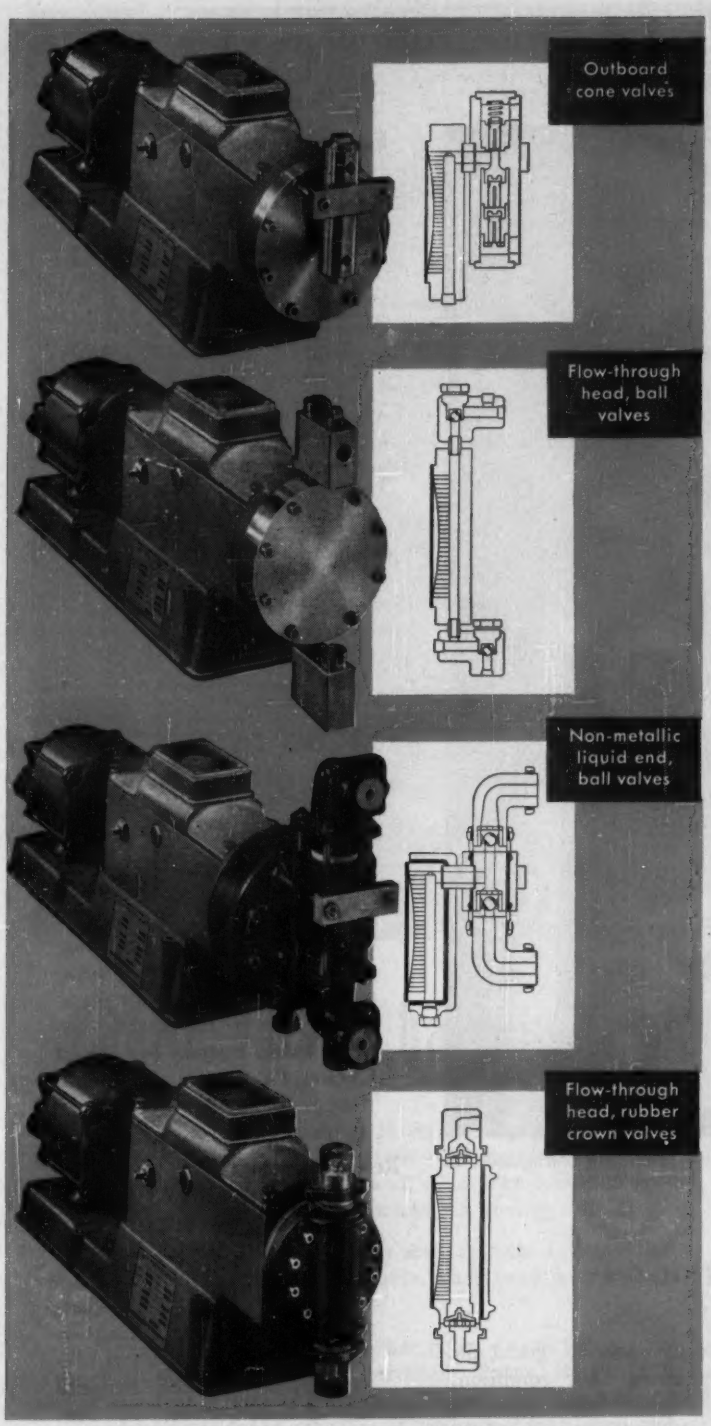
Crusher

Reduces slabs of wax to desired lump size without gumming or sticking.

Recently announced is a crusher claimed to be the first that crushes all types of wax successfully. It will handle materials ranging from the softest low-melting paraffin wax to the hard natural waxes, at rates up to 500 lb. per min. using a 5 hp. drive.

Crusher consists of a single toothed-roll which revolves slowly to chop the wax and bring it through a sizing comb in one pass. Feed lumps or slabs up to 16 x 16 in. are reduced to a size adjustable from ¼ to 4 in. Temperature rise during crushing is so low that no cooling is needed; there is no solids build up.

The Supreme crusher also will handle resins and solid varnishes, DDT, chocolate and maleic anhydride.—**Franklin P. Miller & Son, Inc., East Orange 1, N. J.** 238B



4 VALVE CONSTRUCTIONS

TO CHOOSE FROM IN

Lapp PULSAFEEDER

PISTON-DIAPHRAGM CONTROLLED-VOLUME CHEMICAL PUMPS

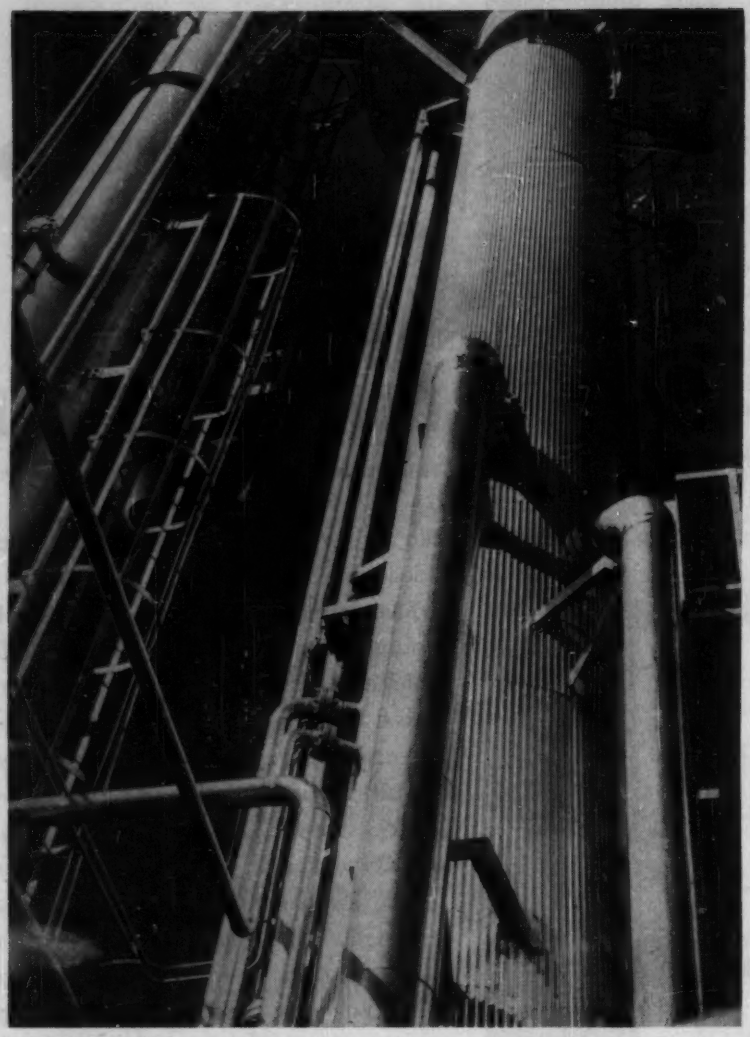
No one valve design or construction is adequate to handle all types of materials which must be pumped in controlled volume. Experience indicates that flow characteristics of fluids are greatly influenced by viscosity, specific gravity, lubricity and temperature; solids in suspension require a special design, whereas low-viscosity, non-lubricating liquids present a wholly different valving problem. Lapp offers the Pulsafeeder in a variety of liquid-end designs, materials of construction, and valve assemblies—four of which are shown here. For your "special problem" in proportioned pumping of liquids, ask us for an engineering recommendation on the Pulsafeeder assembly specifically suited.

WRITE FOR BULLETIN 440 *with typical applications, flow charts, description and specifications of models of various capacities and constructions. Inquiry Data Sheet included from which we can make specific engineering recommendation for your processing requirement. Write Lapp Insulator Co., Inc., Process Equipment Div., 349 Wilson St., Le Roy, N. Y.*

POSITIVE DISPLACEMENT...AND NO STUFFING BOX!

Lapp Pulsafeeder is the combination piston-diaphragm pump for controlled-volume pumping of fluids. Reciprocating piston action provides positive displacement. But the piston pumps only an hydraulic medium, working against a diaphragm. A floating, balanced partition, the diaphragm isolates chemical being pumped from working pump parts—eliminates need for stuffing box or running seal. Pumping speed is constant; variable flow results from variation in piston-stroke length—controlled by hand-wheel, or, in Auto-Pneumatic models, by instrument air pressure responding to any instrument-measurable processing variable.

Lapp



FOR UNHOUSED equipment, plants are finding that smooth or corrugated . . .

Aluminum Protects Insulation

Alert to the need for protecting outdoor plant, Kaiser is supplying sheet aluminum to weatherproof insulation and guard it from mechanical damage. Costwise it's competitive with other coverings, is easy to install, remove and maintain, is strong and fire resistant.

Generally, flat sheet is used over pipeline insulation while corrugated aluminum roofing serves as covering for large storage tanks and pressure vessels. Spun aluminum elbows are available as fittings. Other fittings such as tees can be fabricated on the job.

Choice of aluminum grade, dictated by atmospheric conditions, lies with either utility sheet for ordinary atmosphere or alloy 5050-H34 for severe industrial conditions.

Installation techniques can be varied to allow for the condition of the insulation. Where insulation cannot be completely dried before covering is applied, the filler may be wrapped with a single layer of asphalt-impregnated roofing felt.–**Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland 12, Calif.** 240A

Equipment Cost Indexes

	Sept. 1954	Dec. 1954
Industry		
Avg. of all	184.5	184.2
Process Industries		
Cement mfg.	177.3	177.1
Chemical	185.9	185.7
Clay products	172.1	171.9
Glass mfg.	175.7	175.5
Paint mfg.	179.0	178.8
Paper mfg.	179.3	179.1
Petroleum ind.	182.5	182.3
Rubber ind.	184.9	184.7
Process ind. avg.	183.0	182.8
Related Industries		
Elec. power equip.	187.7	187.5
Mining, milling	186.8	186.6
Refrigerating	204.5	204.1
Steam power	175.2	175.0

Compiled quarterly by Marshall and Stevens, Inc. of Ill., Chicago, for 47 different industries. See Chem. Eng., Nov. 1947, pp. 124-6 for method of obtaining index numbers; March 1955, pp. 178-9 for annual averages since 1913.

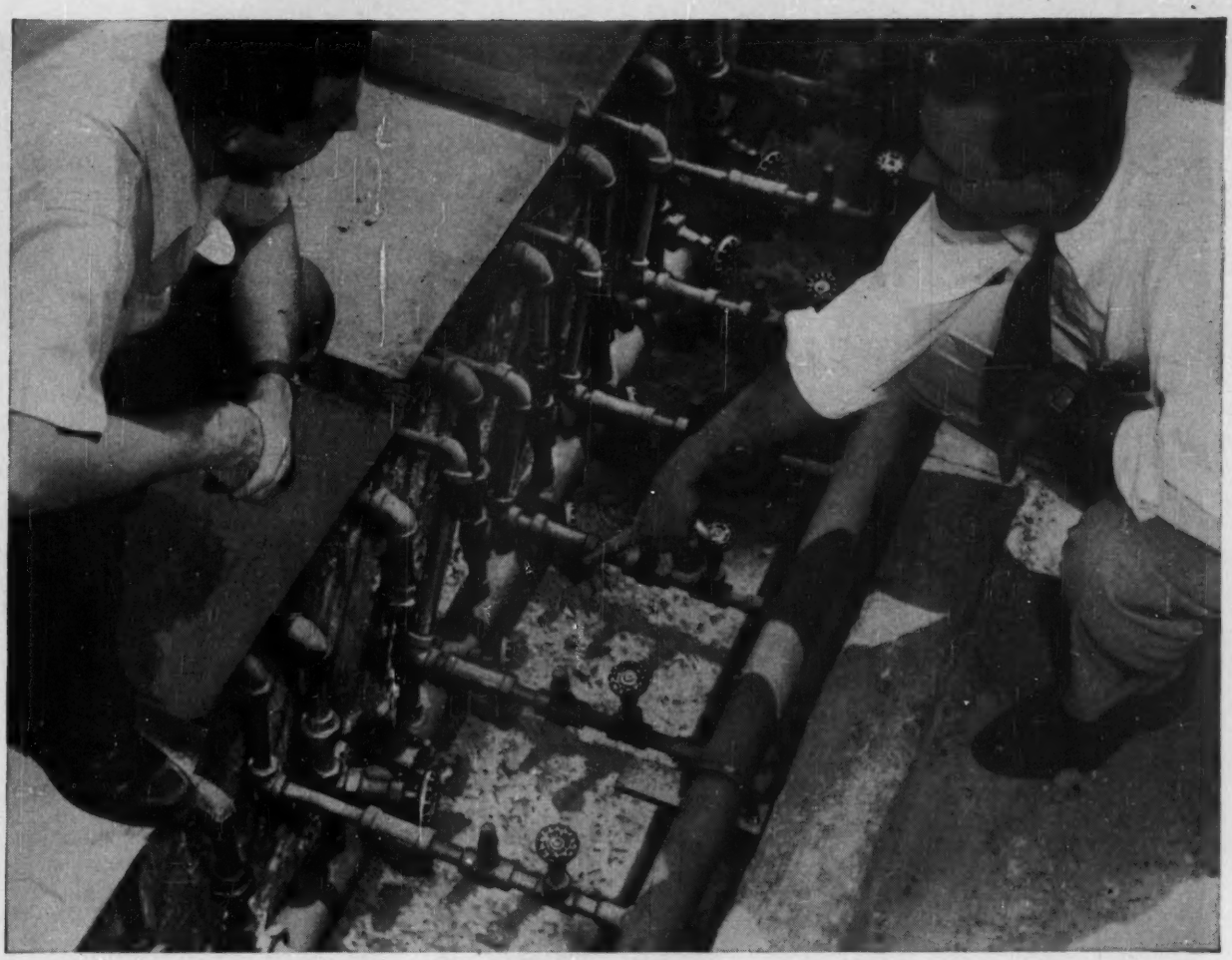
Cellular concrete is easy to produce using the National-Crete process. Preformed foam is added directly to standard concrete mix to give light yet strong building material. Foam-generating apparatus and liquid are readily portable and easy to handle.–**National Foam System, Inc., West Chester, Pa.** 240B

Refractory-fiber felt for service to 2,000 F. can be used for high-temperature insulation, as a refractory filling and packing, and as a filter medium for hot gases and liquids. Thermoflex fibers are highly opaque to infrared radiation, make felt have low conductivity at elevated temperature.–**Johns-Manville, 22 East 40th St., New York 16, N. Y.** 240C

For More Information . . .



about any item in this department, circle its code number on the Reader Service Postcard inside the back cover.



CRANE VALVES have longest life in this sulphur pit

THE CASE HISTORY— Leakage in steam lines to sulphur pit heating coils was hindering operations at International Minerals & Chemical Corp. plant at Lockland, Ohio. The condition prevented servicing of traps, strainers and the heating coils.

Valves that leaked beyond repair after as little as 6 months' service were the source of the trouble. Their seating as well as packing failed to stand up.

In January, 1953, after trying other types, Crane 14½P Plug Type Disc Globe Valves were installed. Today, they're still giving excellent service at low cost. Recently, the steam piping was completely replaced—the Crane valves were repacked and put back in the lines. That's all the maintenance they needed after 18 months in this severe service.

Crane 150-Pound No. 14½P Plug Type Disc Brass Valves

Long-wearing, hard seating surfaces in a rugged, well-proportioned, Crane-designed body make these valves exceptionally suited for steam and other severe services. Consult your Crane Catalog or your Crane Representative.



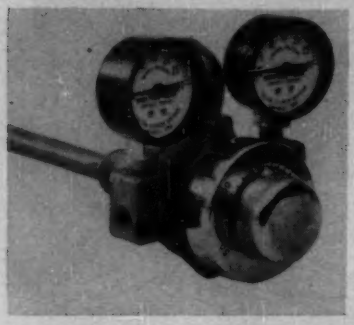


CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955



Thermostatic Controller

Unusually small and rugged, controls temperature of liquids or air.

The new Fultrol thermostatic pilot controller operates valves, dampers and other controls to hold required temperature of liquids or air. It features rapid response and adjustable control characteristics.

Instrument is installed at location where temperature is to be maintained. Sensitive rod-and-tube thermal element is immersed in the medium being controlled.

Any change in temperature at the thermal element activates a small pilot valve. In turn, the pilot varies the control pressure applied to a motor valve or any other final control device.

Using the Fultrol controller temperatures can be regulated in wide adjustable ranges from 50 to 250 F. and from 150 to 350 F. Accurate, easily-read gages indicate both pilot supply pressure and control pressure.–**Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Box 400, Knoxville 1, Tenn.** 242A

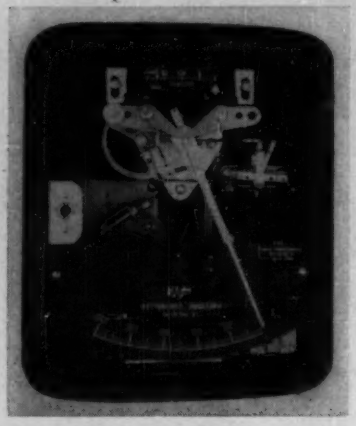
D.C.-to-Air Converter

Changes d.c. thermocouple signal to air output signal.

Low voltage d.c. input from thermocouples and similar devices is converted to an air loading pressure of 3-15 psig. by the type T3C Thermocouple-Air Converter. It enables users to retain their pneumatic recording and controlling panel-components, yet capitalize on many of the advantages of all-electronic process control.

Two main sections make up the converter: the upper is an amplifier-converter; the lower an electro-pneumatic transducer of the null-balance type. In the transducer a magnetic force is balanced against the force produced by an air output pressure coming from the pneumatic pilot.

The relationship between the electrical input and air output is an extremely accurate linear one. Standard temperature ranges from minus 50 C. to 3,000 F are available.–**The Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio.** 242B



Small Controller

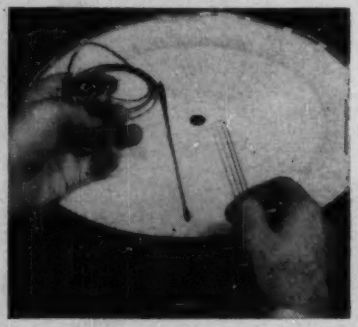
In the low price range is designed for simple processes.

With the model 41A pneumatic controller the user gets sharp on-off or narrow band proportional control of variables such as temperature, pressure, liquid level and humidity.

For on-off action, the new controller snaps the control valve from fully opened to fully closed when the measurement crosses the control point. Such action is suitable for large capacity-demand ratio and negligible lag.

Where throttling action is needed, model 41A is equipped with a proportional unit adjustable from ½% up to 25% of scale. It's a simplified blast feedback proportioning mechanism relying on an air jet rather than bellows-actuated "follow-up" action.

How is the 41A used? It controls pressure on compressors, gas receivers and heating coils in storage and process tanks; it controls conditions within humidification chambers; on supply and receiver tanks it regulates temperature and level.–**The Foxboro Co., Foxboro, Mass.** 242C



Recording Pen

Has sealed ink supply to last for one year without interruption.

With this new recording pen operating dollars are being saved by speeding data interpretation and relieving skilled personnel of monotonous duties. The sealed inking system prevents sludge and oxide from forming; is contamination-proof, non-corroding, non-evaporating and delivers an uninterrupted flow of fresh ink.

Capillary pen of stainless steel is fed from a clear-plastic ink sac containing over a year's supply. "Poisoning" of intersecting records is practically eliminated, thereby improving chart legibility. As many as four pens trace on parallel time arcs only 0.042 in. apart.–**Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.** 242D

High Speed Computer

Slated to determine most efficient conditions for operating refinery.

How to operate most efficiently the integrated complexity of a modern oil refinery will be probed searchingly by the new Mobilac computer. Just installed at Socony's laboratories, Paulsboro, N. J., it facilitates a program of investigation undertaken jointly by the laboratory staff and the staff of


FISHER®
TYPE 16530
30,000 PSI
CONTROL VALVE
Dual operators—independent action—either or both may take independent signals from instrument for automatic operation, or from manual loading station. Motion reduction accomplished through ball bearing screw-jack. Equipped with pneumatic valve position transmitter. Maximum orifice size ⅛" for 30,000 psi pressure drop.
FISHER GOVERNOR COMPANY MARSHALLTOWN, IOWA
WORLD LEADER IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL
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ANNIVERSARY

Socony-Vacuum's refinery at Paulsboro.

To conduct the program, scientists have constructed a model of the refinery; a mathematical one where numbers and formulas represent processing units.

Approximately 100 equations express mathematically the behavior of catalytic cracking, reforming and other processing and blending units at the refinery. These equations are punched on cards, which are read by Mobilac and stored in its memory.

Next additional punch-cards containing data on crude oil characteristics, available charge stocks, motor gasoline specifications, product commitments, and other operating conditions and requirements are fed into the computer. Answers on correct refinery operating procedure are produced in as little as 15 min.

Other uses for the computer are likely to develop in the areas of process development, catalyst research, reactor design, crude-oil analysis and gasoline blending. A twin unit scheduled for Texas will solve problems relating to crude-oil exploration and production.—**ElectroData Corp., Pasadena, Calif.** **242E**

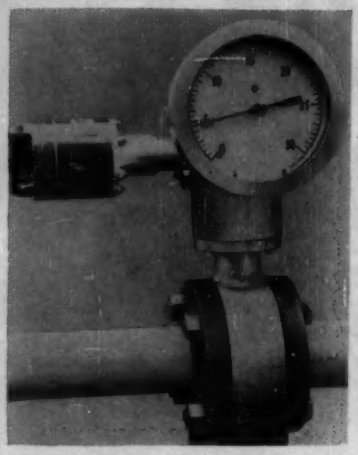
Rupture Disks

Relieve at low pressure, are suitable for corrosive conditions.

Protection in the low pressure range under corrosive conditions is offered by the new models 1A and 1B rupture disks. Available in 2 to 10-in. sizes these disks bring rupture-disk protection to many low-pressure systems that could not be protected previously.

Standard preformed rupture disks have a minimum rupture pressure of 160 psig. But models 1A and 1B can be used on systems requiring rupture pressures from 8 to 100 psig.

They are suitable for vessels containing such highly-corrosive chemicals as sulfuric acid, fuming nitric acid, fluorine, chlorine and hydrochloric acid. This is possible through use of Kel-F and Teflon seals to isolate the controlled disk metal from the contents of the vessel.—**Black, Sivalls & Bryson, Inc., 7500 East Twelfth St., Kansas City 26, Mo.** **244A**



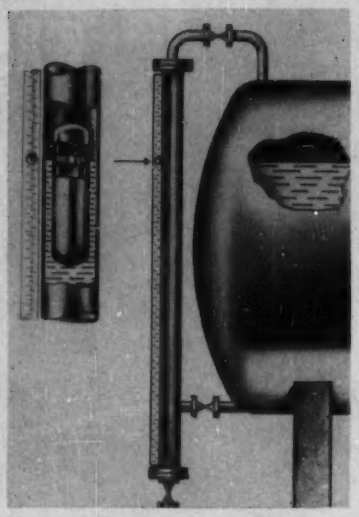
Flow-Rate Meter

Combines features of differential orifice and variable area meters.

A recently announced flow-rate meter is said to measure continuously and accurately quantity rates of every kind of corrosive or non-corrosive gas and liquid. It combines the in-line installation simplicity and economy of the differential orifice with the linear measurement signal, wide rangeability and low viscosity sensitivity of variable-area meters.

Meter contains a tapered, replaceable, meter-range insert somewhat similar to an orifice. A metering target, mounted on an outboard pivot bearing, is positioned in back of the insert opening. If there is no flow it will actually seal the opening. Fluid flowing through the opening forces the target away from the opening in direct proportion to the flow rate of any fluid being metered.

Sizes are built for pipelines from 2 to 12 in. to measure flow rates from 0.2 to 2,000 gpm. of liquid; 10 to 60,000 lb. per hr. of steam; or 1 to 6,000 cfm. of gas. Instrument can be built of essentially any machineable material.—**Devicengineering Co., 1701 Walnut St., Philadelphia 3, Pa.** **244B**



Level Indicator

Used on boilers and tanks where glass would not be safe.

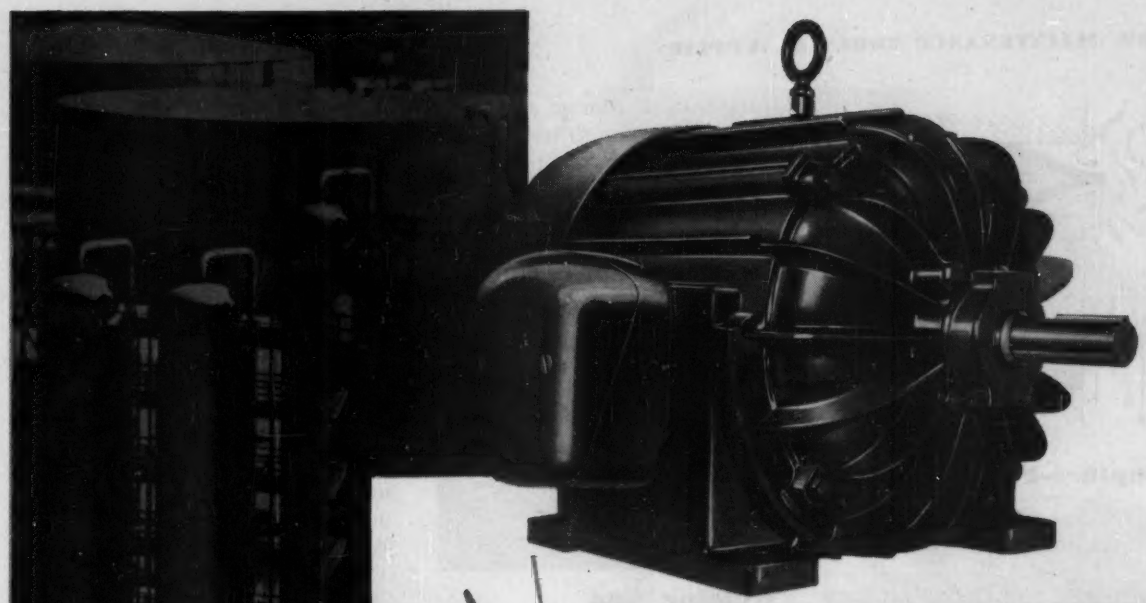
From Stockholm comes word of a new level-indicator designed for use where glass would not be considered safe. It can be used on containers holding liquid chlorine and ammonia; on sulfite digesters, stills and steam boilers.

The Stromberg safety liquid-level indicator consists of a vertical stainless-steel tube connected to the tank. Inside the tube is a non-magnetic stainless-steel float containing a special permanent magnet. The float is balanced so that the magnet is in line with the liquid level.

A glass tube outside the stainless-steel tube and parallel to it is filled with a non-freezing liquid in which floats a hollow iron ball. This ball serves as the indicator.

Weight of the ball is equal to that of the displaced liquid in the glass tube. Thus any slight shift in the position of the float magnet causes a corresponding change in height of the ball. It serves as a sensitive and accurate indicator.

If desired, the indicator can be automatized for remote indication, alarm or regulation. Depending upon the type of tank, the magnet-float can be placed as shown or inside tank with only glass tube outside.—**A. Ekstroems Machinery Co., Floragatan 4, Stockholm, Sweden.** **244C**



FOR CHEMICAL PLANT APPLICATIONS

New DIEHL *TYPE "DIF"*

totally-enclosed, fan-cooled MOTORS

Designed specifically for the Chemical Industry to specifications outlined by chemical plant engineers. Corrosion and moisture resistant features throughout provide long life, minimized maintenance and top efficiency. On dryers, agitators, ball mills, mixers, vibrators, pumps, blowers, compressors and other processing machinery, these rugged motors give uninterrupted dependable performance under the severest operating conditions. For indoor or outdoor service, specify the Type "DIF" Motor for maximum protection.

Here's your assurance of protection against chemical liquids, vapors, gases, fumes, powders and dusts:

- Corrosion and moisture resistant poly-vinyl finish
- Heavy cast-iron totally enclosed construction
- Large cast-iron corrosive resistant terminal box
- Special bronze alloy ventilating fan
- Poly-vinyl insulated stator leads with non-hygroscopic, non-aging, chemical resistant characteristics
- Multiple-insulated stator windings
- Double-protected rotor components
- Oversize pre-lubricated ball bearings

Background photograph courtesy of Standard Oil Co. (N. J.)

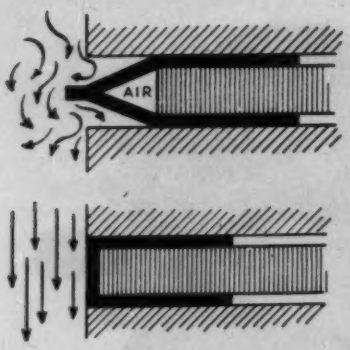
DIEHL MANUFACTURING COMPANY
Electrical Division of THE SINGER MANUFACTURING COMPANY
Finderne Plant, SOMERVILLE, N. J.

Please send me the following bulletins:

☐ Type "DIF" Chemical-Motor Bulletin No. CE-3379
☐ Consolidated Motor Catalog and Price List No. CE-3310

Name_____
Company_____
Street_____
City_____ State_____

OTHER INTEGRAL AND FRACTIONAL HORSEPOWER MOTORS ARE AVAILABLE IN A WIDE RANGE OF TYPES AND SIZES



Rupture-Proof Gasket

Reduces turbulence in pipeline, does not restrict flow.

With the Free Flow gasket there is no danger of rupture at high temperature due to entrapped air between insert and envelope. Further, design of gasket eliminates flow restriction and turbulence in the line.

Inner periphery of gasket has channel-type construction that is flush with inner surface of the pipe. Gasket makes full contact with pipe flanges. Insert extends to the full depth of the gasket envelope thereby eliminating an air space.

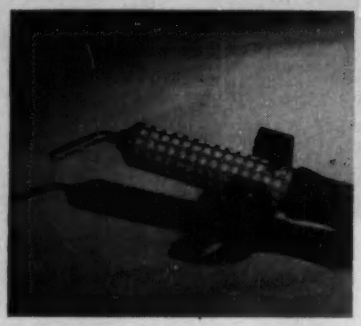
Envelope is made of chemically-inert Teflon. Choice of insert material governs service temperature over range from −100 to 480 F.—**Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill.** 246A

Vacuum Grease

Serves as lubricant and seal on vacuum systems.

Combined in the new Mo-Silicone vacuum grease are the unique chemical inertness and excellent temperature-viscosity relationship of silicone liquids with the outstanding lubricating qualities of molybdenum disulfide. By bodying up the thin silicone liquid with molybdenum disulfide a lubricant is produced that seals tightly against both high and low pressure; also acts as an efficient lubricant for moving parts.

Mo-Silicone grease can be used as a seal and thread compound. Joints not only make up tighter with greater ease but can be broken apart, without damage even after long exposure to high temperatures or severe chemical conditions.—**The Lockrey Co., Southampton, N. Y.** 246B

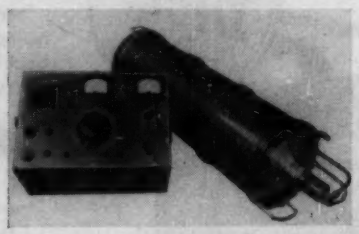


Welding Gun

Handles easily while joining plastic parts.

Light weight for fast action characterizes a new 14-oz. electric hot-gas welding gun. By manipulating an accurate control valve, the operator can regulate the flow of hot compressed gas to obtain the correct temperature. Gun operates on 110 v. with choice of 180, 240 or 300 w. elements.

Wide use is expected for this gun in the fabrication of corrosion-resistant structures and piping of rigid polyvinyl chloride and polyethylene. Other materials that it can weld are acrylics, such as Plexiglas, and soft vinyl sheeting.—**Seelye Craftsmen, Industrial Plastics Div., 984 Central Ave., Minneapolis, Minn.** 246C



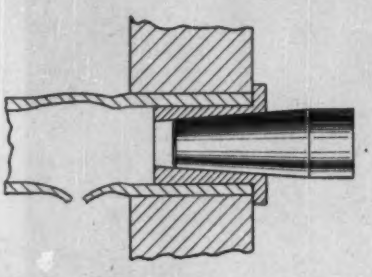
Portable X-Ray

Checks weldments and construction in field or plant.

Although completely portable, the X-Tron 180 X-ray machine packs a wallop that penetrates 2⅛ in. of steel and will traverse pipe line greater than 12 in. in dia. With an end-ground X-ray tube it offers the option of single beryllium window for a straight-away shot or projection of X-rays around a full 360-deg. circle.

A compensating device takes care of line fluctuations. There is a cooling system and protection against both thermal and electric overload. Rayproofing is equivalent to at least 2.5 mm. of lead.

Control panel is semi-automatic, can be operated by relatively inexperienced personnel. All controls are weatherproof.—**Mitchell Radiation Products Corp., 128 East Washington St., Norristown, Pa.** 246D



Tube Plug

Seals off leaks in condenser tubes.

Here's a small gadget that will ease a headache encountered with condensers and heat exchangers. It's a tube plug consisting of: a brass bushing with collar that fits closely in the tube, and a tapered steel plug that is driven into the bushing.

Note that the bushing is parallel to the tube and tube sheet. As the tapered plug enters it expands the bushing to a tight fit. Contact is complete between tube and sleeve because expansion is parallel. No damage can be done to the tube sheet.—**Elliott Co., Lagonda Div., Springfield, Ohio.** 246E

For More Information . . .



about any item in this department, circle its code number on the Reader Service Postcard inside the back cover.

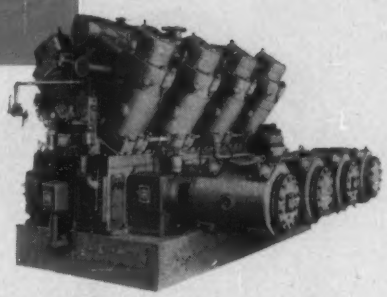
for

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AIR POWER

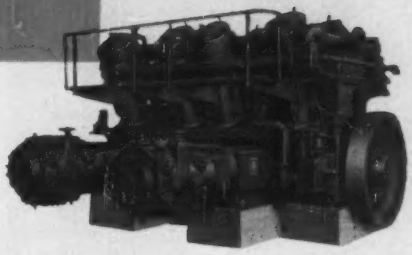
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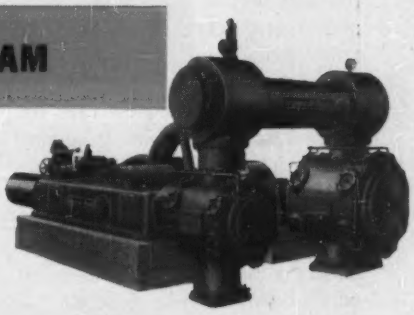
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gas
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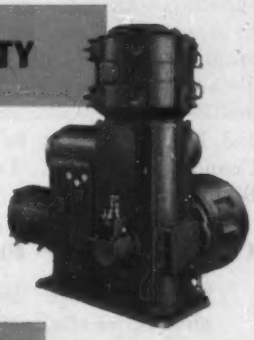
with STEAM

type XPV
steam
driven



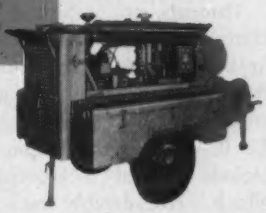
with ELECTRICITY

type XLE,
one of many types
electrically
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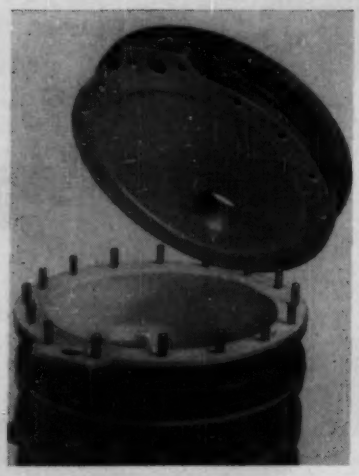
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Sectional Condensers

Have cast-in water passages.

A pattern condenser, recently introduced, is built up of interchangeable sections with domed top and bottom covers. No separate water jacket is necessary as water passages are formed in the castings.

If a change in process calls for an increase or reduction in cooling surface area, the interchangeable sections can be removed or added readily. When a large cooling area is required, two sets of condenser sections can be mounted in parallel connected by T pipes.

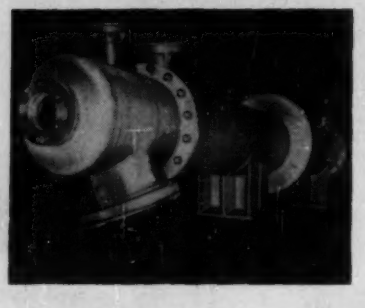
Sections are made of cast iron lined with hard grey acid-resisting enamel, come in 12 and 18 in. dia. Top and bottom covers have 2-in. nozzles for vapor inlet and outlet, and 1-in. connections for water.—**Cannon (CP) Ltd., Deepfields, Bilston, Staffs, England. 248A**

Cooling Tower Fan

Now is stronger and stiffer, gives better efficiency.

Through an improved design, Hartzite plastic cooling-tower and heat-exchanger fans now are stronger and stiffer to give increased efficiency. For fans 14 to 22 ft. in dia. the improvements include use of a tapered blade which is considerably thicker at the shank than at the tip.

A heavily-reinforced leading edge increases stiffness and practically eliminates sag. Building up the leading edge also produces a teardrop cross section to smooth out air flow over the blades and increase air delivery.—**Hartzell Propeller Fan Co., Piqua, Ohio. 248B**



Heat Exchangers

Combine standardization and optional features.

A new line of semi-standard heat exchangers is designed to satisfy a wide variety of heat-transfer problems. They can be shipped within two or three weeks following receipt of order yet include numerous optional features.

For example, the nozzles can be any specified size and location. Exchangers are built either with or without expansion joint and in either stainless or carbon steel. If other alloys are specified then, of course, delivery time will be lengthened.

Exchangers are built to the same high standards as the manufacturer's custom-built units. Shell diameters available are 5, 6, 8, 10, 12, 14 or 16 in. with choice of various lengths in each size. Construction can be 1-, 2- or 4-pass with $\frac{3}{8}$-, $\frac{1}{2}$- or 1-in. tube diameters.—**Downington Iron Works, Inc., Dowington, Pa. 248C**

Flexible Heaters

In blanket or strip form fit many heating needs.

Flexible blanket or strip electric heating elements now are being offered as pre-engineered standard units.

Thinness (0.10 in. or less) and flexibility allow installation where, in many cases, other types of heating elements are unsuitable. Light weight often is a factor in their selection as is their ability to operate under pressures in excess of 100 psi.

Unit insulation is silicone rubber and fibrous glass cloth. The assembly can withstand continuous operation at temperatures in excess of 450 F.

Standard elements vary in size from 1 x $1\frac{1}{2}$ in. over-all to 24 x 42 in. For ease of mounting or for reduced flexibility units are also offered with a perforated stainless-steel backing.—**Electro-Flex Heat, Inc., 516 Asylum St., Hartford 5, Conn. 248D**



Drum Heaters

Wrap around 55-gal. drums to heat contents.

To melt or thin material in 55-gal. drums by applying heat is the function of a new, woven, electric-resistance heater. Easily snap-fastened in place these heaters give uniform heat by snug contact with the drum surface.

Constructed of alloy resistance wire insulated with tough fibrous glass the heater can withstand 450 F. sheath temperatures continuously. For heating acid or alkali compounds, Teflon-insulated elements are available.

Heater sections are wired together in pairs to fit between the chimes. Ratings are 1,500 or 3,000 w. on 115 v.; 3,000 w. on 230 v.—**Pre-Fab Heater Co., Guilford, Conn. 248E**

FAMOUS LIGHTHOUSES OF AMERICA



Boston Light, America's first lighthouse, was built in 1716 at the north side of the entrance to the main ship channel in Boston Harbor. The scene of several bitter contests for possession during the Revolutionary War, it was destroyed by the British in 1776. A new tower for this famous light was built in 1783 and is still in use today.

Guiding Light to users of electrochemicals is the integrity of Niagara Alkali Company, for over fifty years a pioneer in the development and production of these important materials. You can rely on Niagara for quality in... Nialk® Liquid Chlorine, Nialk Caustic Potash, Nialk Carbonate of Potash, Nialk Paradichlorobenzene, Nialk Caustic Soda, Nialk TRICHLORethylene, Niagathal® (Tetrachloro Phthalic Anhydride)

NIAGARA ALKALI COMPANY

60 East 42nd Street, New York 17, N. Y.



Vacuum Pump

Shows increased pumping capacity for diffusion type.

A new line of diffusion and booster pumps handles a greater capacity over the critical pressure ranges and will exhaust to substantially higher forepressures. Size for size the new Ring-Jet pumps have from 10 to 100% more capacity than conventional pumps of similar dimensions and heat input.

Diffusion pumps operate by sweeping a previously evacuated space with oil vapor. Air molecules remaining in the space diffuse into the oil vapor and are carried out by the moving vapor stream.

In pumps of this type, the pumping speed is limited by the cross sectional area of air-flow path. This in turn is limited by the permissible distance from the oil jet to the condensing surface.

In the Ring-Jet pump the conventional jet cone has been replaced with a ring of jets. This allows the cross sectional area of the air-flow path to be increased substantially without increasing the distance from the beginning of each jet stream to the nearest condensing surface.

There is no increase in the volume of oil vaporized, therefore, no additional heat input is needed. Boiler pressure actually is lower; hence oil oxidation is reduced and oil life lengthened.–**F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia 20, Pa.** **250A**

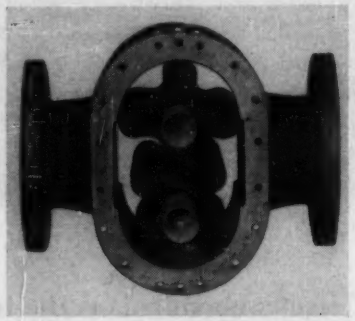
Liquid Metals Pump

Moves liquid metals within cooling or heating systems.

Liquid metal, being a conductor of electricity, can be pumped by applying the principles of electromagnetism. Thus it is, that the new Callery a.c. conduction-type EM pump has no moving parts or packing glands.

With this pump the metal is contained within a tubular section having higher electrical resistance than the liquid metal. If an electrical current is passed through the metal, in a direction perpendicular to the surrounding magnetic field, it produces a force that sets the metal in motion within the tube.

Any liquid metal can be moved that will wet the pumping section and that has a high conductivity. Direction of flow can be reversed by reversing the direction of the magnetic field with respect to the direction of the current through the pumping section. Flow rates can be controlled positively from zero to maximum.–**Callery Chemical Co., Callery, Pa.** **250B**



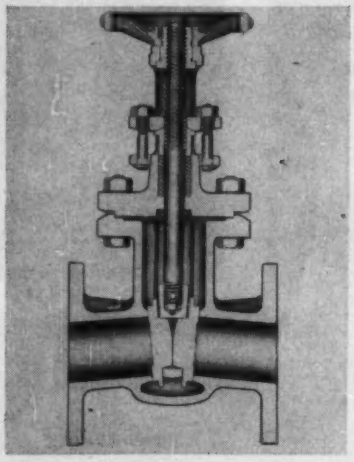
Positive Rotary Pump

Costs less, is more efficient and economical.

Positive-displacement pumping at one-half the cost of comparable pumps is claimed for a new rotary pump. Operating over a wide viscosity range and handling slurries up to 78% solids this pump will not aerate liquids or break semi-solids.

Liquid is moved through the pump by the action of meshing rubber-lobed impellers. There are no valves or pistons. Liquid being pumped serves to lubricate the impellers. When they become worn only minutes are needed to change them.

Available sizes permit handling flows up to 2,200 gpm. at pressures up to 1,000 psi. Pumps are self-priming and will not cavitate or vapor lock. They can be installed above the level of liquid to be pumped or at a considerable distance from the liquid source.–**Lindquist Pump Corp., 10001 West Jefferson Blvd., Culver City 12, Calif.** **250C**



Alloy Valves

Feature new design wrinkles to improve performance.

A completely new line of alloy gate, globe and angle valves is corrosion resistant and tops in performance.

Valves are constructed of Crane 18-8S Mo stainless steel or Craneloy 20 high-nickel, high-chromium stainless steel. Teflon packing is used on all valves.

Gate valves have a unique and exclusive split-wedge disk design. The identical, circular disks are placed back to back in a carrier. The disks have a convex trunnion on the back and an integral circumferential flange which bears on guide slots in the valve body.

Since the seating load is uniformly distributed over both disks, excessive force is not required for tight seating and there is no dan-



VALVE OPENING *equals* PIPE OPENING

4" valve port area— 12.75 sq. in.

4" pipe ...area— 12.73 sq. in.

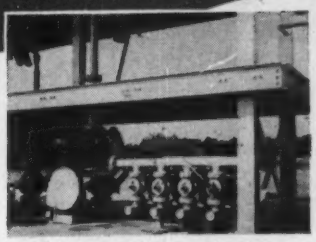
That's the formula of success behind **acf** Rectangular Port Valves! Because they have a port area at least equal to the pipe itself... turbulence and loss of head pressure are held to a minimum... even when handling heavy slurries and other viscous ladings.

All **acf** *Cylindrical* Lubricated Plug Valves... both those with rectangular and round port openings ...feature split-second, quarter-turn shut off that meets the rigid control requirements in the petroleum, natural gas, and processing industries. Maintenance is especially low because they are fitted with TEFLON* gaskets to prevent head leakage, and have no line seats exposed to fluid flow.

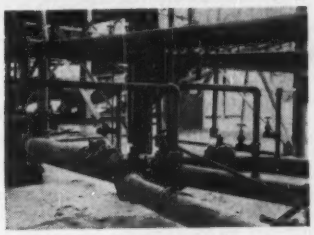
ACT NOW TO KEEP DOWN VALVE MAINTENANCE COSTS!

Representatives in 50 Principal Cities. Write for Descriptive Catalog 5-CM, **acf** Industries, Incorporated, Valve Division, 1501 E. Ferry Avenue, Detroit 11, Mich.

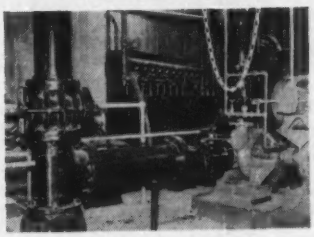
*DuPont Tradename



On Petroleum Applications



In Chemical Plants



In Sewage Treatment

acf CYLINDRICAL FULL PIPE AREA PLUG VALVES

ger of buckling of the disks. This uniform pressure, plus freedom of the disk to rotate, is highly effective in reducing seat wear and preventing galling of seating surfaces.

In the new globe and angle valve disk-stem construction, the stem extends much farther into the disk, with a minimum amount of radial clearance. Chattering of the disk is eliminated and seat wear is reduced greatly.

Valves are built with screw ends, sizes ¼ to 2 in.; and with flange ends, sizes ¼ to 6 in.—**Crane Co., 836 South Michigan Ave., Chicago 5, Ill.** **250D**



Multi-Cyclone

Features system flow-pattern that boosts efficiency and reduces erosion.

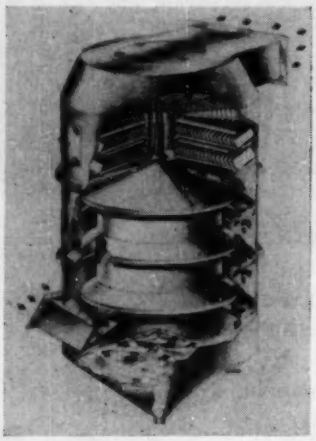
In the Paraclone dust collecting system two cyclone circuits are used to eliminate recycling of dust, thus boosting efficiency and reducing erosion.

Normally a large installation of small cyclones is less efficient than individual small cyclones. Difference traces to unpredictable flow of gas in large ducts, and to variations in dust discharge pressures between cyclones.

These disadvantages have been overcome in the Paraclone by producing an equal suction at the dust discharge of individual cyclones. Each Paraclone is connected to a dust discharge duct that conveys all the collected dust and 4-5% of the flue gas to one or more high-efficiency secondaries.

Gas discharging from the secondary cyclones is returned to the inlet side of the Paraclone collector by a small circulating fan. Constant volume of gas is handled by the fan, making the secondary system independent of total gas flow in the primary circuit.

Allowing for increased efficiency, the new Paraclone system is competitive, costwise, with conventional single circuit systems. It can handle high or low temperature gases, abrasive or non-abrasive particles.—**Aerodyne Development Corp., 1520 Lakeside Ave., Cleveland, Ohio.** **252A**



Wet Dust Collector

Intimately contacts dust or fume-laden air with water curtain.

In the new Van-Truer wet dust collector, dust and fume-laden air contacts liquid continuously during its flow through the unit. Built in the form of a cylindrical drum with a series of cones and baffles, the collector produces a cascade of water across the path of air flow. The baffles set up a cyclonic washing action and turbulence, separating the wet dust and carrying it to the tank below.

Solids removed from the air stream settle out in the sludge tank and the clarified water is recirculated. Sludge can be removed either manually or by conveyor.

At the top of the unit is an entrainment separator so that cleaned air is discharged without suspended moisture.—**Van-Truer Co., Inc., 12600 Beech Rd., Detroit 23, Mich.** **252B**

Gear Pump

Now fitted with mechanical seals on both normal and heavy duty models.

Both the rotor-bearing-sleeve-type Viking pump for normal duty and the Viking pump for heavy duty now are built with mechanical seals. It is said this type seal used with these pumps gives leakless operation eliminating need for packing.

At the same time carbon graphite bushings have replaced previous bronze bushings. No longer is it necessary to oil externally since the bearings are lubricated by the liquid being pumped.—**Viking Pump Co., Cedar Falls, Iowa.** **252C**

Pop-off relief valve seals tight with no leakage below release pressure. Seal is a resilient member fitted into the poppet head which seats into a spherical section of the valve body. Spherical seat obviates need for close stem alignment and troublesome close-sliding fits.—**James-Pond-Clark, 2181 East Foothill Blvd., Pasadena 8, Calif.** **252D**

Vertical turbine pump incorporates radically new impeller design that produces higher head and efficiency with extremely low NPSH. Built in 10, 12 and 14 in. sizes for 400 to 2,100 gpm.—**A. O. Smith Corp., Hydraulic Products, 5715 Smithway St., Los Angeles 22, Calif.** **252E**

For More Information . . .



about any item in this department, circle its code number on the Reader Service Postcard inside the back cover.

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acf BUILT **DURADOME**



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✓ Superior pressure-type construction (complete ring sections) means heavier steel *all* the way around for greater durability and protection for costly ladings.

✓ Standardized all-welded underframe provides flexibility of use with tanks of all standard types and capacities . . . more economical maintenance.

✓ All-welded jacket for insulated cars—of heavier guage steel, with one-piece ellipsoidal head. Streamlined . . . more weatherproof . . . needs less maintenance.

DURADOME tank cars are available in all standard types and capacities . . . for sale or lease through . . .

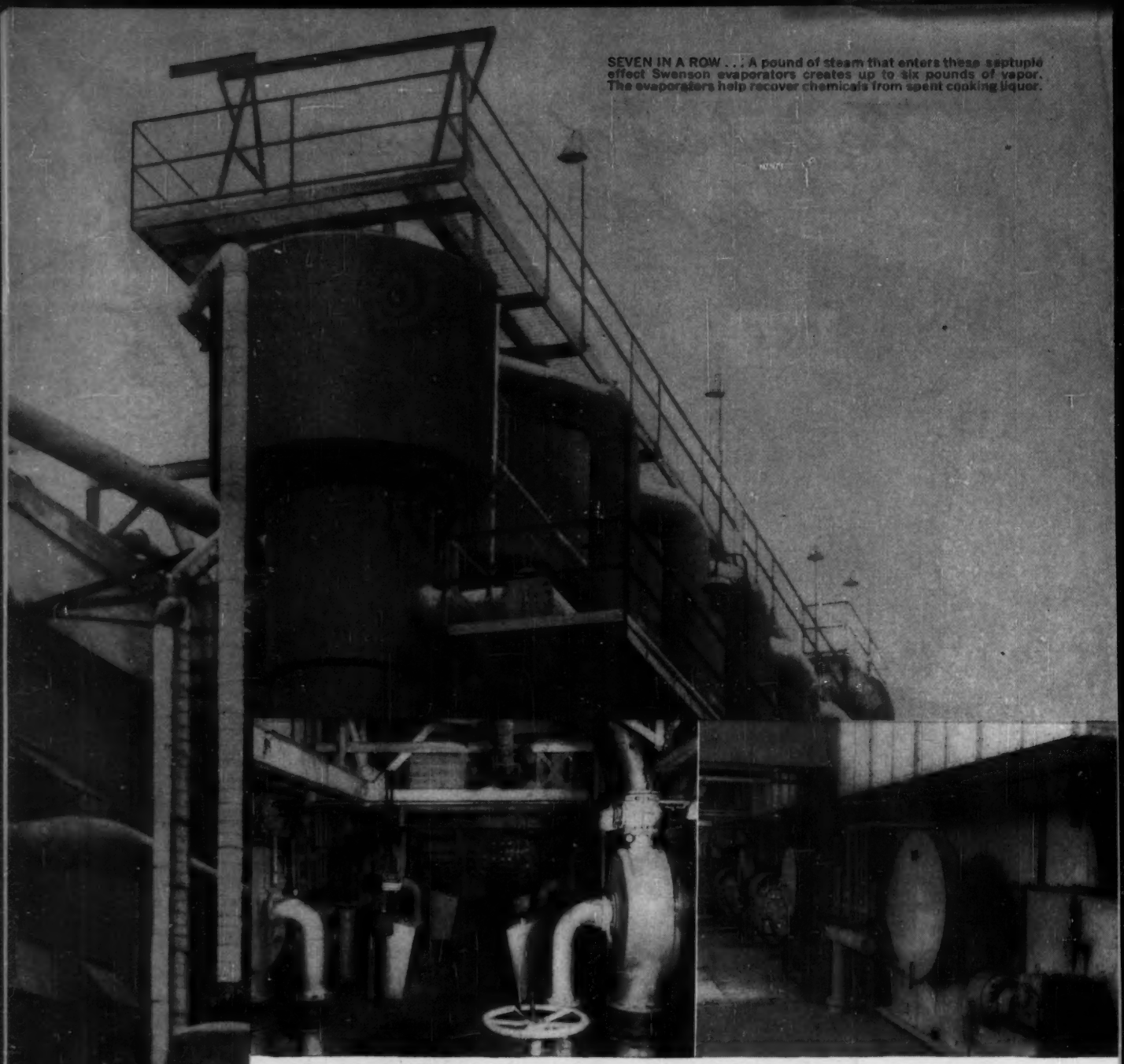
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SEVEN IN A ROW . . . A pound of steam that enters these septuple effect Swenson evaporators creates up to six pounds of vapor. The evaporators help recover chemicals from spent cooking liquor.

Swenson Pulp Washing Systems, consisting of two lines of washers with three drums per line, provide well-washed pulp at a low dilution factor. The proper correlation of pulp washing and evaporation at this mill contributes to lower production costs.



Longview Fibre Company is located on a 160-acre waterfront site on the Columbia River near Longview, Washington. It has an annual production of approximately 80,000 tons of paper and 180,000 tons of container board.

Half a Million Pounds

OF EVAPORATION CAPACITY PER HOUR!

Lower operating costs through increased evaporator steam economy—that is the story at Longview Fibre Company since septuple effect Swenson Evaporators were installed. One pound of steam creates approximately six pounds of vapor in the septuple effect setup. With two septuple effect evaporators Longview has capacity to obtain one-half million pounds of vapor per hour.

The Longview economy story is not new to Swenson. Ninety per cent of the septuple effect evaporators used today were engineered and installed by Swenson. The high economy of multiple effect evaporators has helped industries of all types slash their evaporating costs to the bone. Put Swenson's engineering know-how and experience to work in your plant. Swenson engineers are ready now to assist in solving your evaporator problems.

SWENSON EVAPORATOR COMPANY

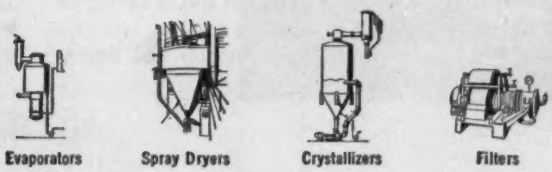
15669 Lathrop Avenue, Harvey, Illinois

SWENSON

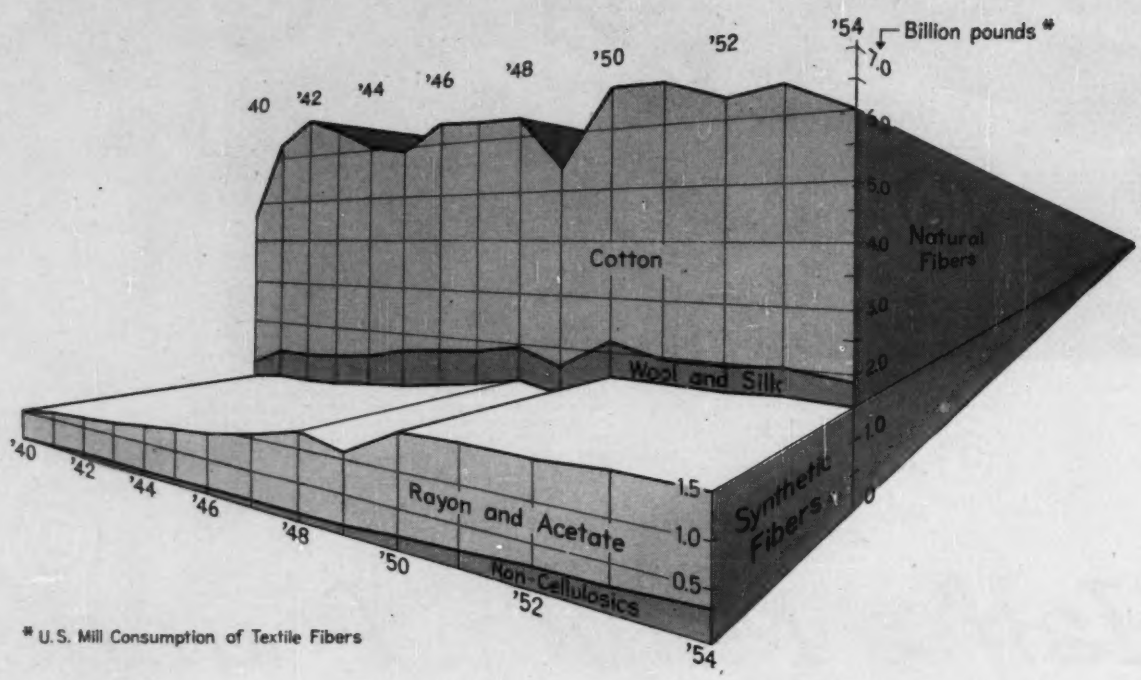
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* U.S. Mill Consumption of Textile Fibers

Finally, a Brighter Outlook for Textiles

After nearly five years of cut-backs, over-all textile production is bouncing back. Total gain should hit 6% in 1955, with non-cellulosics up about 20%.

William H. Chartener, McGraw-Hill Dept. of Economics

The pickup in textiles—though not ballyhooed like the stock market boom—is one of the most imposing features of the recent recovery in business.

This pickup was in full swing in October, when textile production bounced 9% above the September level. And it continued through the fall months into 1955, when even prices began to rise.

Even with the year-end surge, though, textile mill production in 1954 was the lowest in five years—even below the 1947-1949 average used as base for the Federal Reserve Board index. The severe slump that took hold in both natural and some man-made fibers in mid-1953 held the seasonally adjusted index between 91 and 95 through the first nine months of last year. Only non-cellulosic synthetics showed a year-to-year gain.

▶ **Will It Last?**—How long is the current improvement in textile business likely to continue? And what's the longer range outlook for textiles?

These are questions of keen interest to the chemical industry, not only because of increasing demand for man-made fibers, but also because of the chemical potentials involved in treating natural fibers for improved qualities and in dyeing all types of fibers.

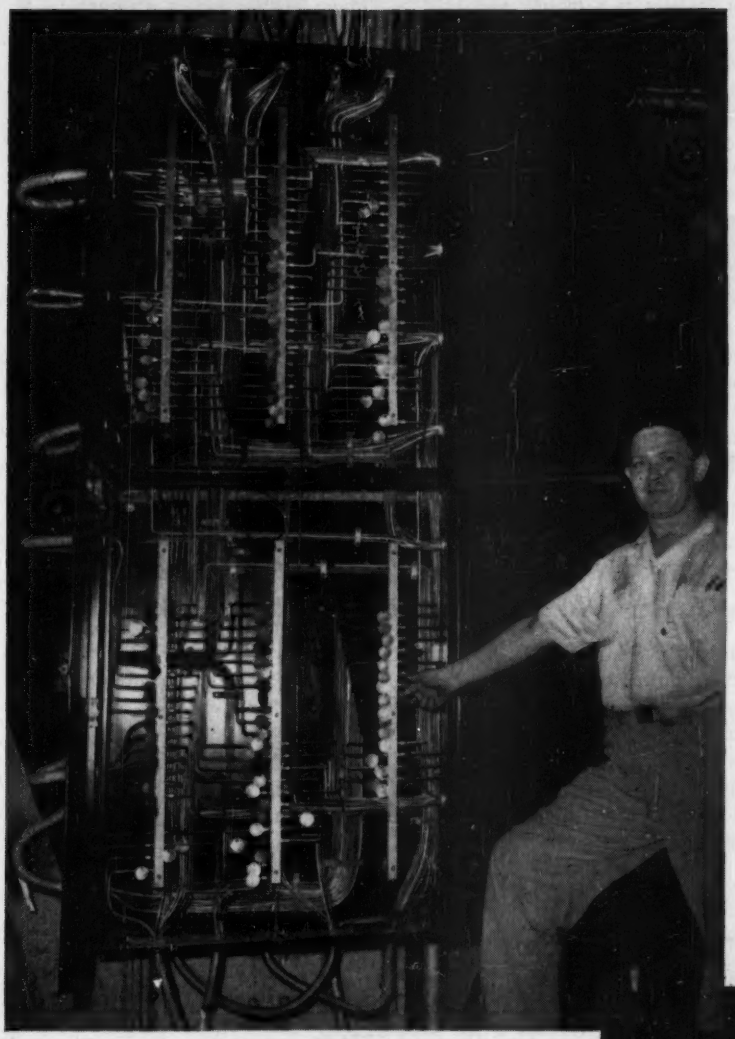
Inventory reduction and declining mill order backlogs were behind the 1953-54 drop in textile production. According to Walter Storm, economist for Chicopee Mills, total stocks made but not consumed hit a high point in November 1953, then dropped 15% during 1954. Rayon and synthetic stocks declined at all levels—from mills right down to retail stores—more than cotton inventories, which actually rose during the year at the mill level. Apparel makers' inventories reached the lowest point in four years.

Mill order backlogs fell off through the first five months of 1954—as a consequence of inventory paring. But brisk improvement later in the year brought unfilled orders up to 40% over the spring low. Moderate price rises called back into production some marginal equipment that had been idle.

▶ **This Year at Least**—The recovery in textile activity appears plenty

FOR INSTRUMENTATION AND CONTROL

Cabled Tube



Some time ago Revere ran an advertisement featuring Crescent Armored Multitube for use in pneumatic and hydraulic instrumentation and control systems. The advertisement created so much interest that we thought you might like to see a photograph of an actual installation. The Control Board Junction Box shown here has 22 runs of Multitube coming into this box comprising 224 Revere Copper Tubes of 1/4" O.D. The picture was taken in the Glenwood Landing, N.Y. Power Station of the Long Island Lighting Company. The tubes go to instruments that report information on temperature, main and reheat steam pressure, boiler feed and condensate pump pressure, fuel oil and gas pressure, liquid levels, tide level and for the control of fuel feed, draft dampers, boiler drum water level and various control valves.

This is a relatively new use for Revere Copper Tube, but it is an important one in these days when new ways are being found to obtain process information more quickly and accurately, or to achieve automatic control. Crescent Armored Multitube is made by Crescent Insulated Wire & Cable Co., Inc., Trenton 5, N.J., in lengths up to 1,000 feet. It consists of a group of long tubes twisted together in cable form, protected by a flexible interlocked galvanized steel armor, or by plastic, or both. As many as 19 tubes, 1/4" O.D., can be cabled, with one tube in each layer color-coded. Larger tubes can also be cabled, including 5/16", 3/8" and 1/2". This construction affords protection during shipment, installation and use, and speeds up installation greatly. For further information, write Crescent, and for tube in copper and aluminum, see the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

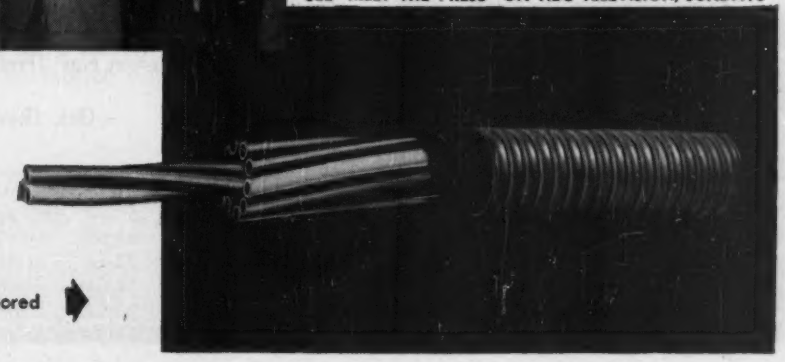
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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

Control Junction Box at Power Station of Long Island Lighting Company, showing use of Crescent Armored Multitube. Note that relatively sharp bends can be made without damage to the cabled copper tube.



Construction of Crescent Armored Multitube.

strong enough to assure total output in 1955 appreciably above last year—probably by about 6% for all fibers. It should be sustained by rising consumer income and by the general improvement in industrial production. Rayon production is expected to rise 10% and non-cellosic fiber output may jump as much as 20%.

But textile production has a tradition for running in fairly short cycles, averaging, historically, a little less than two years from peak to peak. The principal reason for this seems to be wide swings in inventories, which, in turn, result from the sharply competitive nature of both the fiber and apparel industries. The various stages in which inventories must be held aren't integrated and they have displayed an unhappy tendency to gang up in alternately building and reducing inventories.

So the result may well be that whatever part of the current upswing in production stems from efforts to rebuild inventories will not hold into 1956. The industry by then could be on another downswing.

▶**Not That Simple, Though**—Despite the many people who profess to be guided by it, the "textile cycle" doesn't really provide a really accurate guide to the industry's movements. Before World War II, for instance, the periods between high points ranged all the way from nine months to nearly four years!

So be wary in using this tradition indiscriminately; it could be awfully misleading.

▶**Beyond the Cycle**—In the longer range outlook for textiles, these questions are of predominant import to the chemical industry:

- What will be the total textile market?
- How much will man-made fibers be able to boost their share of this market?
- What specific gains are in prospect for non-cellulosic fibers in particular?

For textiles as a whole, the future's not particularly exciting. If current trends continue, per capita consumption will stay about as it is. So production will increase roughly with population.

Annual civilian per capita consumption of all fibers has settled at about 36 lb. per yr. in the postwar years. In the first half of 1954, the annual rate slipped to only 32 lb., but this was undoubtedly a reflection of the general business slump we were going through then.

Importantly, such growth as does occur in textiles will probably be entirely in man-made fibers. Wool consumption, which has fallen to 7.5% of the total mill consumption of fibers, will continue to decline—in both absolute quantity and percentage. Relative production costs are against wool. Similarly, silk consumption is now only a tenth what it was in the 1930's and shows no promise of increase.

Only cotton, which is beginning to make its peace with synthetic fibers with the aid of chemical treatment and conversion, has a good chance of holding its own. But annual consumption will probably continue to range between 4 and 4½ billion pounds.

▶**Synthetics Have Problems, Too**—Man-made fibers, particularly the non-cellulosics, have enjoyed boom times ever since commercial introduction of nylon in 1939. But after a very fast spurt in the immediate postwar years, this class of fibers has slowed to a more moderate annual increase—if 10-20% per year can be called moderate.

There are three main reasons:

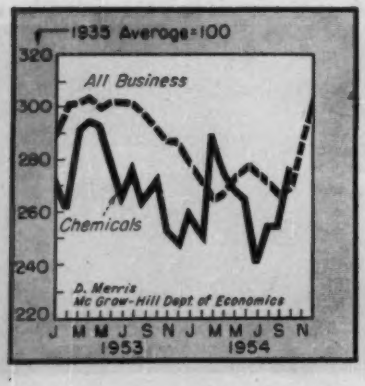
- Synthetic fibers, so far, are deficient in some important textile properties. Thermoplasticity and low moisture absorption, which characterize the chemical polymer fibers, have produced especially troublesome problems: need for low temperature in washing and ironing, resistance to dyes, discomfort in hot weather.

Easy pickup of electrostatic charge (with the possibility of dirt attraction and shock) has also been a handicap. And the tendency of some synthetic yarns to "pill" or "fuzz" more than natural fibers has created bad consumer reaction.

- Synthetic fibers have proved almost too perfect in other respects. Durability is the main culprit. A major manufacturer of men's sox announced last spring that it was halting production of nylon sox because they were wearing too long. In ladies hosiery, volume has been maintained only because of consumer insistence on sheerer, hence less durable, styles.

Ease of laundering, too, has reduced the numbers of such items as shirts, underwear and hosiery

CONSUMPTION INDEX



Business Activity (Dec.) **301.2**

Chemical Consumption Nov. (Prelim.) . . **274.0**

Oct. (Rev.) **277.2**

Indexes	Nov.	Oct.		Nov.	Oct.
Fertilizer	63.94	61.64	Paint & varnish	24.80	25.85
Pulp & paper	33.07	34.00	Textiles	10.10	10.46
Petroleum refining	27.14	27.55	Coal products	10.86	10.40
Iron & steel	14.84	14.13	Leather	3.78	3.94
Rayon	28.57	27.88	Explosives	8.39	8.49
Glass	21.37	24.69	Rubber	6.24	6.41
			Plastics	20.89	21.78

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people feel they need at any one time. And the strength of synthetics cuts down materially on the weight required per yard of fabric.

• Finally, cotton, rayon and acetate have had a resurgence in some uses. Even wool has benefited from blending with synthetics. These natural and older man-made fibers have been able to take advantage of properties unduplicated by non-cellulosics—as in apparel where color is important in style.

Some of rayon's big gains, as in tire cord and carpeting, have been at the expense of cotton. But the relative loss by cotton has been small.

▶**Chemicals for Treating**—Among several promising technological developments that may benefit both the textile and chemical industries is cyanoethylation of cotton by treating with acrylonitrile. This process is said to give cotton increased receptiveness to dyes, better rot resistance and greater strength.

Production is still experimental. American Cyanamid has built a plant at Rossville, Ga., in cooperation with the Standard-Coosa-Thatcher Co.; and Monsanto has a unit underway at Texas City, Tex. But with an acrylonitrile add-on of 15% by weight, this process could prove a substantial new chemical market.

▶**A Possible Way Out**—The only modest increases indicated for textile production in the years ahead—resulting largely from the growing percentage use of durable synthetics—might be boosted by exploiting new uses and aggressive merchandising. Advertising experts suggest that consumers who have been trained to turn in automobiles, not because they're worn out, but because they're obsolete, could and should be trained to adopt the same attitude about buying new clothes. Of course this would be aimed mostly at men; most women who can have been following this line for years.

But even if successful, this course seems to offer very limited prospects. Textile's outlook, while bright in the foreground, doesn't glow very rosily on the horizon.

	Ethyl	Syn. Methyl (Millions of Gallons)	Isopropyl
1954	222	162	138
1953	238	169	150
1952	230	166	141
1951	253	185	160
1950	203	136	145
1949	169	127	115
1948	171	150	139
1947	164	84	113
1946	150	77	79
1945	428	75	82
1944	586	72	80

Big 3 Alcohol production cut as . . .

Solvent Output Heads Down

Manufacturers show remarkable restraint in keeping production only slightly ahead of consumption. Market firm though many prices eased.

Even though production slightly exceeded consumption, 1954 was a good year for the alcohol and solvent market. Use by the paint, varnish and lacquer industry, as well as by textiles, was down from 1953; so it was surprising—and gratifying—that sales were as strong as they were (see *table*).

The sensible restraint practiced in 1954's alcohol and solvent markets is a strong indication that, without excessive military demands, the industry has reached maturity. Its spectacular development is over and further demand increases—or decreases—will come from normal economic growth factors.

Naturally, some segments of the field have more to worry about than others. This was 1954's pattern:

▶**More Ethyl Chemicals**—While the over-all volume of ethyl alcohol (estimated at 222 million gal.) was down 7.5% from the 1953 total, the amount that went into solvents, aldehydes, chemicals and other products was the highest it's been for the past three years.

Why this reversal? Because in 1952 and 1953 large amounts were used in synthetic rubber production. In 1954, none was used.

Opening inventory for the year was 28.9 million gal.; closing inventory was 27 million. This is the lowest it has been in three years. A healthy sign.

Early in the year the price structure was rather unsettled. Producers were understandably concerned about the large stockpile of alcohol that the French Government was trying to dispose of in foreign markets. Consistent offers were made to U. S. importers at a price of 26¢/gal., delivered.

Also, the Rubber Reserve Board suggested that industry ought to help liquidate part of the 9 million gal. in inventory when they closed the alcohol-butadiene plants. Surplus domestic alcohol—in addition to other factors—lowered quotations to large buyers. The result: a general decline of 2½ to 3¢/gal. during the first quarter.

▶**Two New Plants**—Two producers

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☆Non-Clog Wet Grinding!

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The closed screw feed prevents the uncontrolled inrush of air into the mill and assures cleaner operation, guards against health, fire or explosion hazards, and greatly reduces housekeeping expense.

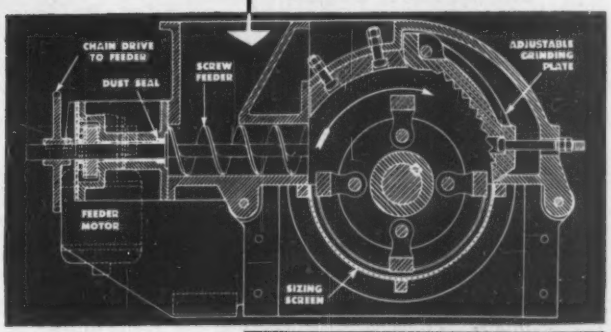
Non-Clogging, Accurate Wet Grinding
The reduction and sizing of sticky, wet or oily products is efficiently controlled by the screw feeder. Materials will not clog or ball up the mechanism.

No Separators, Fans Or Cyclones
Ground materials are discharged completely pulverized without tailings or oversize products to be separated. Collectors, fans or separators are entirely unneeessary.

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The small floor space, the elimination of vibration, and the need for only a simple sealed bin or chute, keeps the easy installation of a Helix-Seal Mill very economical. No costly, cumbersome equipment is required.

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—Enjay and National Distillers—put new synthetic plants on stream in 1954, bringing synthetic capacity up to about 215 million gal. It's estimated that synthetic alcohol production was actually 165 million gal. (77% of capacity), compared with 57 million produced from molasses, grain and other sources.

Commercial Solvents and National Distillers both virtually discontinued their production from molasses and turned to synthetic manufacture. Publicker is now the only exclusively fermentation producer left in the field.

During the second half of the year business was strong enough to start some talk of higher prices. But the underlying factors did not justify any raise and it's reported that the sole fermentation producer renewed a number of contracts at last year's prices. At the close of the year the French Government had not found a buyer for its alcohol. So inventory is still hanging over the market, contributing to an easy price structure.

▶ **Methanol Dips Too**—The pattern of the synthetic methanol market somewhat paralleled the ethyl alcohol market. Production, estimated at 162 million gal., was approximately 4% less than in 1953.

But though volume could be considered good, a number of producers made sales at prices below quoted market. Dupont, largest producer, lowered its price 10% in June.

With the warmer winter, the anti-freeze market was poor. The price of ethylene glycol dropped and this reduced the call for methanol anti-freeze. Large accounts were taken at 3¢ under the industrial market. (The material offered for anti-freeze, though, was an off-specification alcohol.)

▶ **Pioneers Drop Out**—The year also saw two pioneer anti-freeze makers discontinue sales. National Distillers' USI division, original anti-freeze producer, sold its business to Mathieson for a substantial sum. And Enjay felt that its sales effort could better be put on products that show greater profits.

Sales of wood-distillation methanol were very good, reflecting larger shipments of proprietary solvents used as denaturants.

▶ **Isopropyl: Stiff Competition**—The production of isopropyl alcohol, estimated at 138 million gal. in 1954, was about 8% less than the 1953 output. Part of this reduction was loss of export business. But the greater part was caused by less demand for acetone.

Two producers who had used the greater part of their isopropyl as a raw material for acetone, became more aggresive in the sale of isopropyl alcohol during the year. The market became much more competitive.

As was the case in 1953, isopropyl also lost some gallonage due to lower ethyl alcohol prices. In a number of cases ethyl was actually selling below isopropyl.

The use of isopropyl in the petroleum industry—started in 1953—continued. This increased volume offset some of the textile markets which had been lost.

▶ **Acetone Spotty**—As indicated above, the market for acetone in the textile industry was poor. A rather spotty condition continued all year causing a price reduction of ½¢/lb. during the last quarter that could be traced to the oversupply.

At the same time producers of phenol from the cumene process—in which acetone is a byproduct—were offering their production for the first time. At least one supplier endeavored to take business below the quoted market price during the second half of the year.

Even though a certain part of the acetone market has been lost permanently, prices can't go much lower because the selling price and cost of production are rather close now.

▶ **MEK Up**—For the past three years the production of methyl ethyl ketone has increased each year. The two major producers—Shell and Enjay—have increased their facilities every year and sales and production have been in approximate balance.

In 1954, two big outlets for ketone, the vinyl and automotive-finishes, were both good. As demand for ketone was strong, there was virtually no price shading.

During the latter part of the year Celanese entered the field with a small plant. However, the plant is not strategically located and it is not expected to be much of a market factor this year.

▶ **Others and Esters**—The market for the esters of ethyl, butyl and isopropyl alcohols was good but the growth factor has been checked. Butyl esters continued to lose ground to methyl isobutyl ketone, the same as ethyl and isopropyl acetates have lost ground to methyl ethyl ketone.

Chemical uses for n-butyl alcohol continue to increase. The same is true of sec-butyl acetate. As in other years, the supply of fermentation amyl alcohol has practically disappeared. All the amyl now consumed is produced synthetically by Sharples Chemicals, which is able to dispose of its supply at a fair price.

▶ **What's Ahead?**—The time has come for the alcohol and solvent industry to make a careful appraisal of its future. Not only is it faced with increasing capacity each year, but it is also facing a loss of markets.

Rayon, which has been a large consumer of solvents, has lost ground in the synthetic fiber race. And while rayon producers are putting an improved product on the market, acetone is no longer the solvent anyway. So much acetone business in textiles is permanently lost.

Since at least three-fourths of acetone comes from isopropyl alcohol, this, in turn, reflects on the

More Economic Aid for You

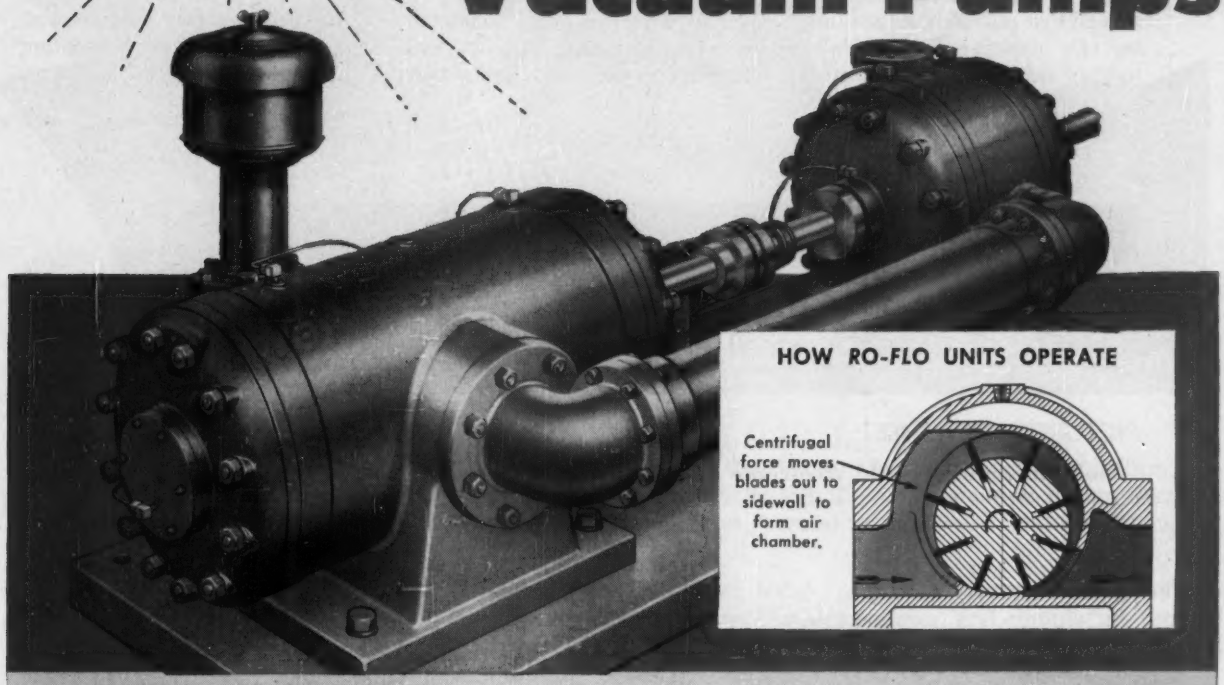
This analysis of solvents markets launches a new monthly series of up-to-the-minute reviews and well-informed forecasts covering all major chemical areas—sulfur to soda ash, plastics to petrochemicals. These will be timed to fit the news—not the calendar—for top value to you, the chemical engineer. And of course we'll keep bringing you broad-interest features on all phases of business and economics.—ETT

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A-4569

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Ro-Flo is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

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production of isopropyl. To move this surplus, isopropyl sellers are more concerned about ethyl prices and expect to be competitive at all levels.

Another trouble spot is excess ethanol capacity. Normally this would be expected to have an unsettling market effect. But costs of selling and distributing alcohol are so high that producers are not making very attractive profits. Unless military demands jump, all ethyl, methyl and isopropyl producers will have to be satisfied with declining markets.

Another complicating factor is the fact that Stanolind is revamping the large Carthage Hydrocol synthesis plant in Texas. While the plant makes several products, the ethyl and isopropyl alcohol output will affect 1955 markets most.

New ammonia plants cloud the future for methanol. Methanol can be made in ammonia plants with very slight modification in operating conditions. If there is excess ammonia, there might be temptation to switch to methanol

The protective coating field is undergoing a complete change in the types of coatings being produced. Unfortunately for the solvent market, demand for solvents will be somewhat reduced.

But despite these problems, most solvents makers view the future with cautious optimism.

GUIDED TOUR CONTINUED

PICTURED FLOWSHEET

Solvent refining with azeotropic distillation.. 304

NAMES IN THE NEWS

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Azeotropic distillation . . .

. . . is the key to Texas' new process for furfural extraction and recovery in solvent refining of middle distillates. Here's how it works on a plant scale. (p. 304)

Losing your friends?

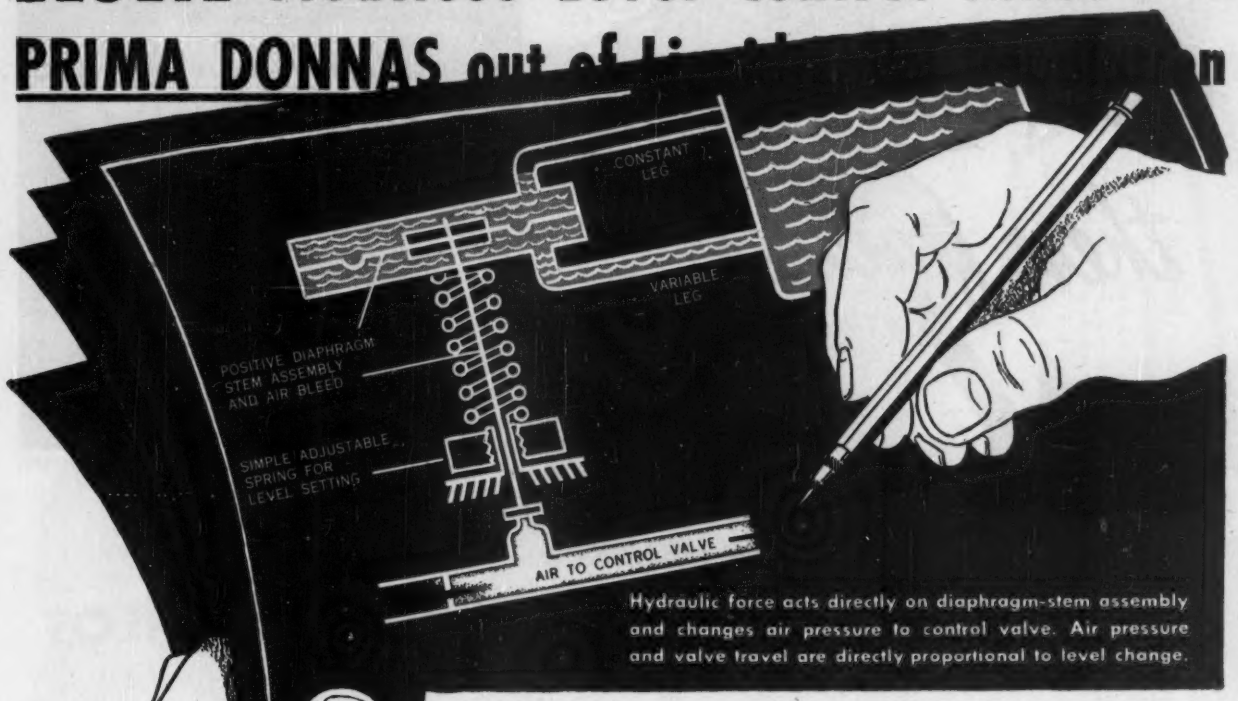
Could be if aren't keeping close tabs on who's going where. Names in the News is your checklist. (p. 311)

New technical literature . . .

You can now get—free and fast—literature on any subject in your field. Keep your technical files up to date.

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Inside Back Cover

LESLIE *Floatless* Level Control takes the PRIMA DONNAS out of li[illegible]n



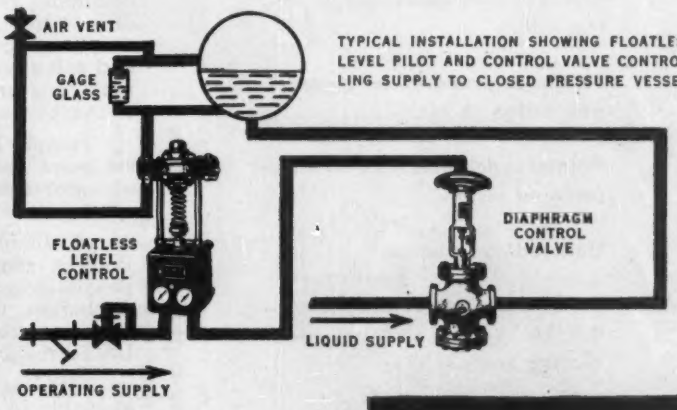
Hydraulic force acts directly on diaphragm-stem assembly and changes air pressure to control valve. Air pressure and valve travel are directly proportional to level change.

Here is level control that is not affected by surface agitation, equipment vibration, or the roll of a ship—a simple design that provides steady, positive, precise control even under extreme conditions.

Thousands are in service today, providing accurate control of liquid level (plus or minus 1" water column) and eliminating the problems caused by troublesome linkages, torque tubes, floats and stuffing boxes.

Note these special features—

1. **Can be installed anywhere below liquid level . . . on control panel, if desired.**
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3. **Diaphragm stem assembly is only moving part. Diaphragm element doesn't require recalibration during service.**



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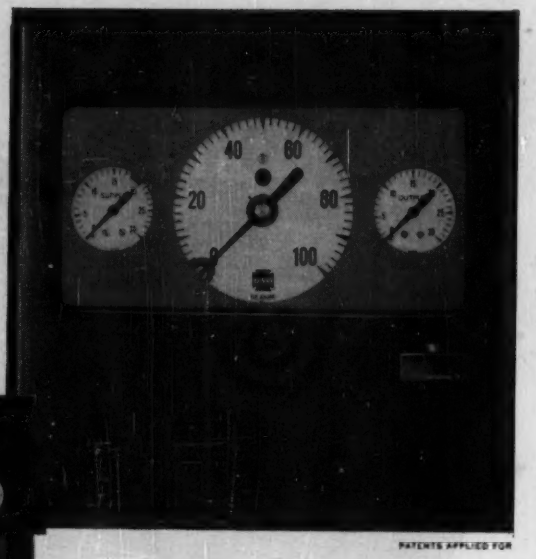
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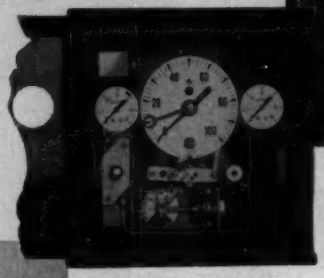
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Simple knob or screwdriver adjustments provide easy set point and control action selection. USG Pressure Pilot also provides 1-100% proportional band or differential gap control with direct or reverse action as required.

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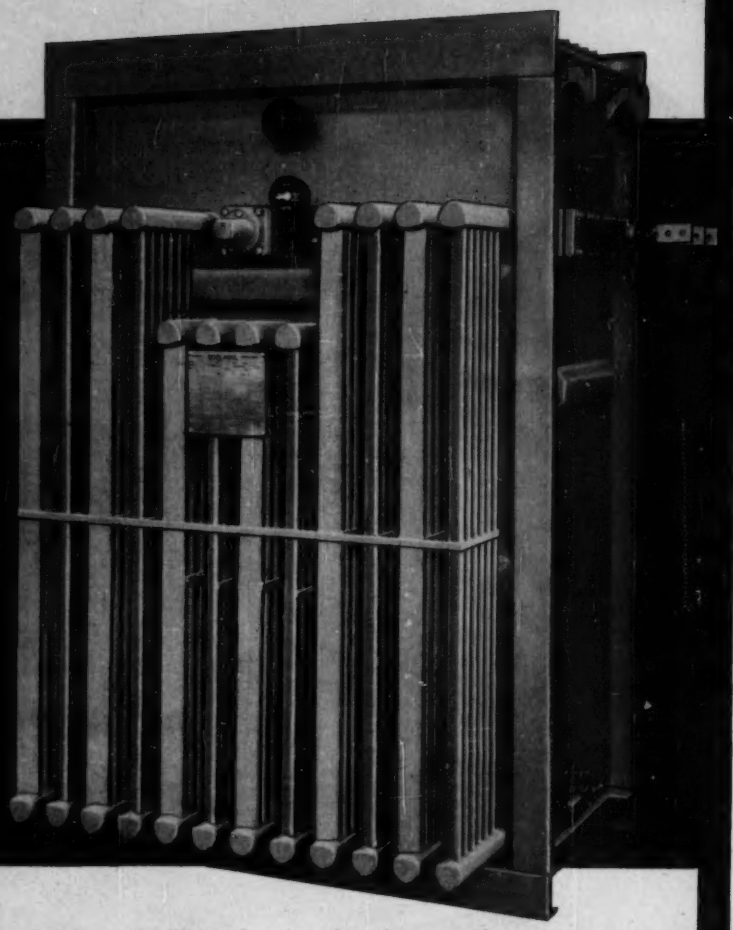
ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

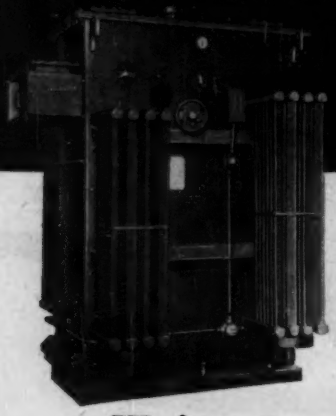
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For outdoor installation, or for applications where it is desirable to locate the transformer away from the switchgear, Wagner can furnish these liquid-filled transformers in ratings to 2000 kva, 15 kv and below. Bulletin TU-13 gives full information.

Now, Wagner liquid-filled unit substation transformers are available in new, improved close-coupled units, rated from 300 to 2000 kva, that can be flush-mounted with any make of switchgear. They can be used in both single and double-ended unit substations to form neat, compact, streamlined substations for modern industrial service.

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T38-2



Unruly urea toes the line

At Deere & Company's towering new $20 million Pryor, Okla., plant, Aloyco valves police the hard-to-handle corrosives involved in producing urea.

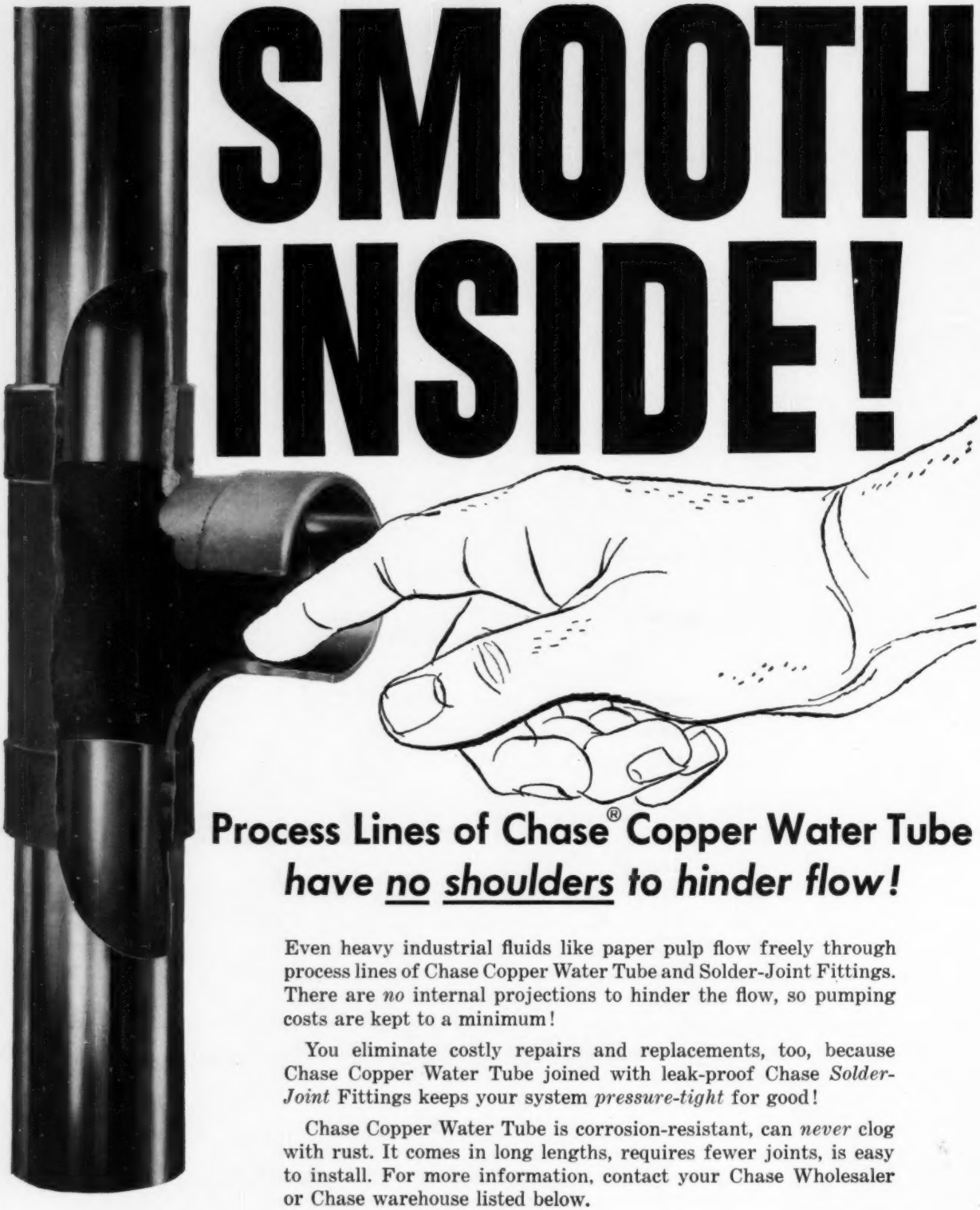
Picking Aloyco valves for this tough job came naturally to Foster Wheeler, designer and builder of the 260-ton-per-day unit — newest urea plant completed. These valves are famous for standing up under the worst kind of corrosive and erosive conditions in scores of leading industrial processing plants.

Alloy Steel Products Co., Inc., 1301 West Elizabeth Avenue, Linden, N.J.

5.2

Longer Lasting
ALOYCO
VALVES
1ST IN CORROSIVE SERVICE

SMOOTH INSIDE!



Process Lines of Chase® Copper Water Tube *have no shoulders to hinder flow!*

Even heavy industrial fluids like paper pulp flow freely through process lines of Chase Copper Water Tube and Solder-Joint Fittings. There are *no* internal projections to hinder the flow, so pumping costs are kept to a minimum!

You eliminate costly repairs and replacements, too, because Chase Copper Water Tube joined with leak-proof Chase *Solder-Joint* Fittings keeps your system *pressure-tight* for good!

Chase Copper Water Tube is corrosion-resistant, can *never* clog with rust. It comes in long lengths, requires fewer joints, is easy to install. For more information, contact your Chase Wholesaler or Chase warehouse listed below.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Detroit	Los Angeles	New York	St. Louis
Atlanta	Cincinnati	Grand Rapids†	Milwaukee	Philadelphia	San Francisco
Baltimore	Cleveland	Houston	Minneapolis	Pittsburgh	Seattle
Boston	Dallas	Indianapolis	Newark	Providence	Waterbury
Charlotte†	Denver	Kansas City, Mo.	New Orleans	Rochester†	(†sales office only)

PRESSURE COOKER for GAS



AN ACME-FABRICATED WELDMENT

This odd-appearing structure, made of type 310 stainless steel, is now hard at work in a catalytic cracking plant for one of the nation's largest utility companies. It's one more example of the many unusual pressure vessels being fabricated by Acme for chemical processing installations everywhere. Whether the vessel or component you need is large or small, irregular in shape or unusual in design, Acme's complete facilities — including the latest mobile X-Ray equipment — guarantee you exact adherence to your specifications as well as to your delivery schedules. Find out now why so many important companies specify Acme weldments . . . call us today.

STEEL • STAINLESS STEEL • EVERDUR • ALLOYS

Send us your blueprints for a prompt quotation and ask for our informative folder, ACME PLANNED WELDMENT FABRICATION.

A.S.M.E. U68-U69 Qualified Welders • A.P.I.-A.S.M.E. Approved
Underwriters Label and Inspection Service • Navy Approved
National Board Approved • Hartford Steam Boiler Inspection Service

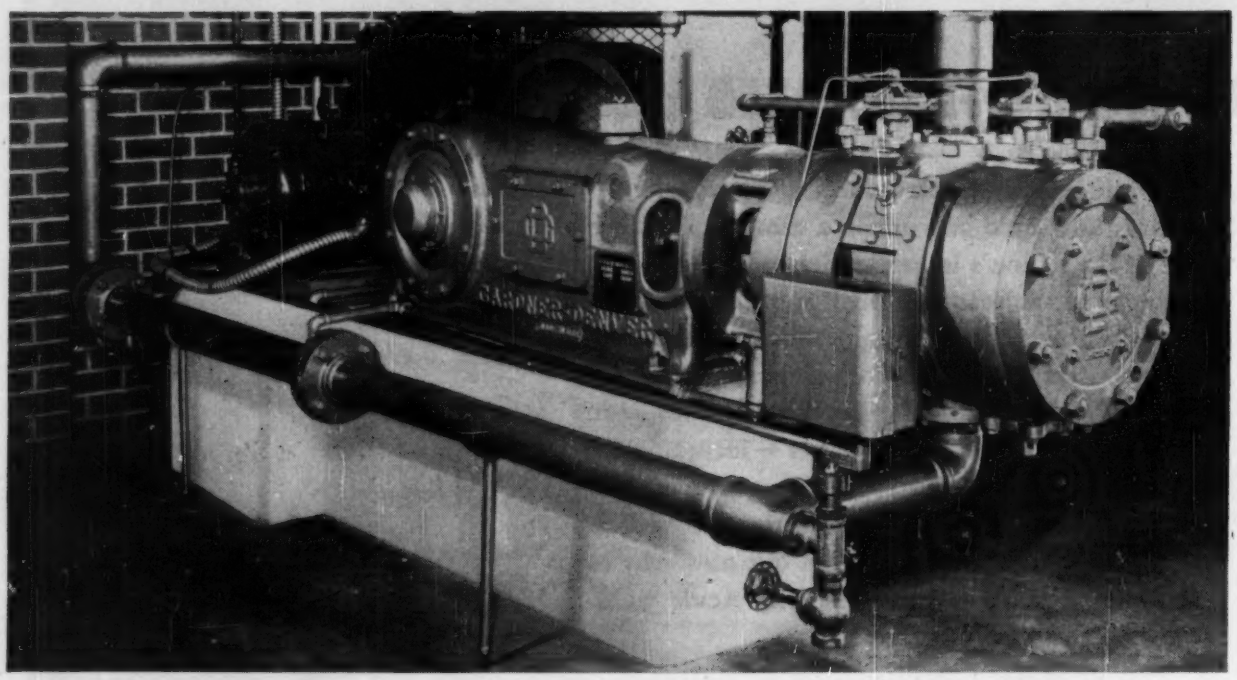
Acme WELDING
DIVISION of THE UNITED TOOL & DIE CO.
1054 New Britain Ave. • West Hartford 10, Conn.

National Representative TRANSMISSION EQUIPMENT CO., Inc.
441 LEXINGTON AVE., NEW YORK 17, N. Y.

OIL FREE... CAREFREE...

...that's compressed air from the dependable GARDNER-DENVER CRX Carbon Piston Compressor.

Send for Bulletin CRC-10.



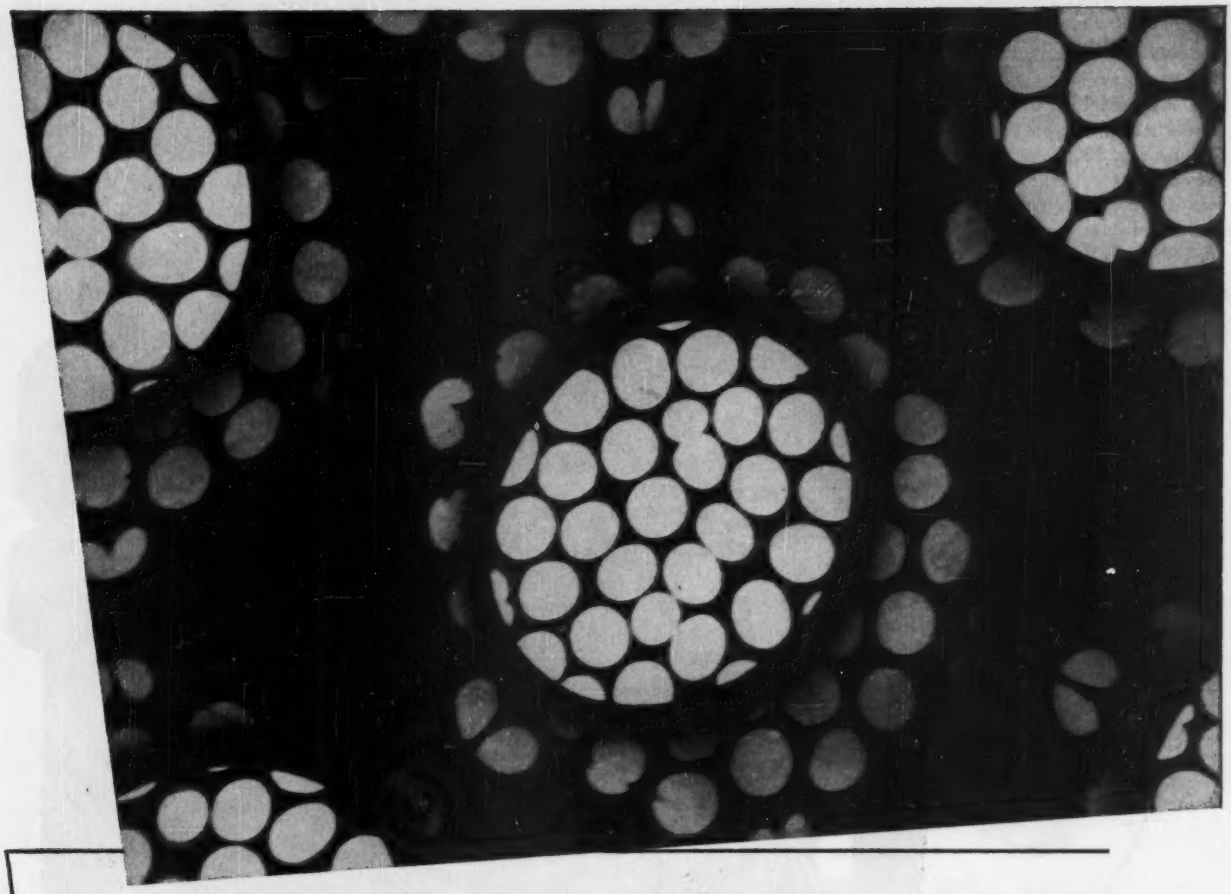
SINCE 1859

GARDNER-DENVER



THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario



22,000 times as big as life

to show one why of Dicalite's "sharp" filtration

This electron micrograph of one of the more than 10,000 kinds of diatoms shows clearly the delicate, yet rigid, "skeleton" whose lace-like grid helps make diatomite such a superior filteraid. Imagine, for a moment, millions of these diatom frustules—needle-, disc- or boat-shaped—piling up strawpile fashion in the filter pre-coat or filtercake . . . then visualize bacteria or other sub-micron sized solids (enlarged to the same scale) coming against this barrier. Now, in your mind's eye, you can see clearly how the diatomite "grillwork" catches and holds all solids, while the fluid being filtered flows rapidly on through the billions of tiny channels which make up 90% of the filtercake's bulk.

Many processes and products in the chemical, industrial, food and pharmaceutical fields would be practically impossible without this "sharp" filtration provided by high-quality diatomaceous filteraids such as Dicalite. These Dicalite filteraids, processed under rigid controls from the highest quality diatomite, afford a complete range of uniform, sterile, chemically-inert products for the filtration of almost any liquid. They have provided the answers to many processing problems – they could well be the answer to yours. We will be glad to furnish full information, samples adapted to your requirements, or technical engineering aid if required.

Dependable GLC GREAT LAKES **Dicalite®** DIATOMACEOUS MATERIALS

DICALITE DIVISION GREAT LAKES CARBON CORPORATION • 612 S. FLOWER ST., LOS ANGELES 17, CALIFORNIA

Autoclave of Annealed Ductile Cast Iron... the first pressure vessel made by the Cooper-Bessemer Corp., Mt. Vernon, Ohio. Designed and approved for internal pressure of 350 p.s.i. at 300°F. with jacket pressure of 125 p.s.i. at 350°F. Oval manhole cover, blind flange, two agitators and thermometer well are also of annealed ductile cast iron to ASTM Spec. A-339-51-T. Body weight: 18,485 lb. Cover: 5,000 lb.



Ductile Cast Iron

Specified for Pressure Vessel

This 600 gallon autoclave of ductile cast iron is for use in a methylation process.

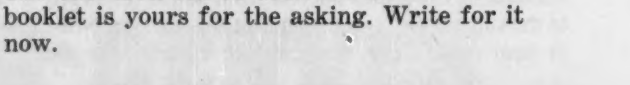
Unlike conventional flake graphite cast irons, ductile iron has a spheroidal graphic microstructure. That's why its mechanical properties are closer to those of steel than to those of gray iron.

Take a look at these test figures from heats used for the autoclave:

Ultimate tensile strength, p.s.i...64,500/69,700
Yield strength, p.s.i.....49,000/54,700
Elongation in 2" %.....19.5/23.5

Combining the process advantages of cast iron and the product advantages of steel, ductile cast iron is a logical material for process equipment.

See for yourself how this economical iron ... several times stronger than gray cast iron, and up to twelve times tougher . . . can help you. Send for a copy of "DUCTILE IRON, The Cast Iron THAT CAN BE BENT!" This booklet is yours for the asking. Write for it now.



ductile iron... the cast iron that can be twisted and bent

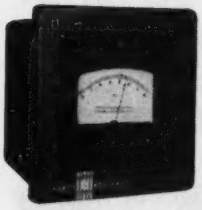
INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.



A new door is open

TO pH & REDOX INSTRUMENTATION



Here's the modern approach to process pH—a continuously measuring Panel-Mounted pH Indicator. This timely industrial version of our widely accepted Stabilized Bench-Type Indicator gives a 24-hour-per-day check on pH *or redox* with the same 0.02 pH accuracy as its lab-type counterpart.

The versatile Indicator offers a number of monitoring possibilities. Primarily a point-of-measurement indicator, it can also actuate remote meters (scale and pointer only) or a simple potentiometer recorder. Or, several Indicators, spotted through the process, can indicate locally and feed their respective values to one multiple-point Speedomax® recorder.

ONLY L&N BUILDS THESE STANDARD FEATURES IN A PROCESS pH INDICATOR

Low warm-up time of less than 1 minute for accurate readings. No de-humidifying period to wait. No desiccants required.

Unaffected by "error-inducers" such as line voltage surges, electrical pick-up, and zero drift.

No modifications in grounding system needed to measure grounded or ungrounded solutions.

Completely enclosed case keeps out water or corrosive fumes.

Manual and automatic temperature compensation in one Indicator. Switch to either as desired.

Simple maintenance by operating personnel. Conventional wiring with printed components makes service items inexpensive and easy to install. Entire chassis can be changed in only 60 seconds.

Highly accurate without recourse to external meters or recorders. Design takes advantage of exclusive features of L&N electrodes.

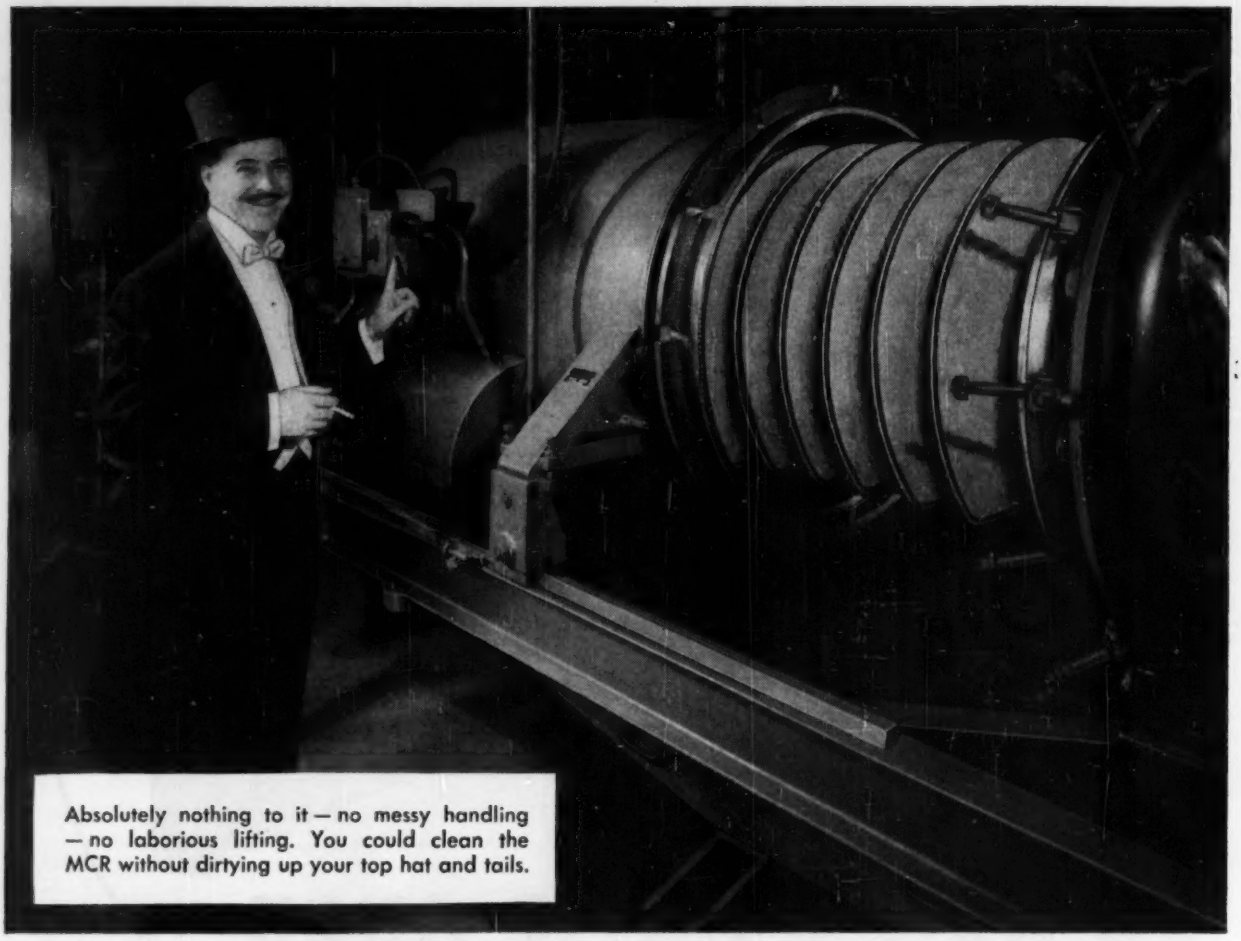
0 to 14 pH range in 0.1 pH div. 0 to 700 mv. in 5 mv. div., and 0 to 1400 mv. in 10 mv. div.

Die cast aluminum case only 12″ x 11″ x 11″.

List numbers—7678 (115 v., 50 to 60 cycles); 7679 (230 v., 50 to 60 cycles).

For details, write to Leeds & Northrup Co., 4916 Stenton Ave., Phila. 44, Pa., for Data Sheet ND42-96(1).

LEEDS & NORTHRUP
instruments *automatic controls • furnaces*



Absolutely nothing to it — no messy handling — no laborious lifting. You could clean the MCR without dirtying up your top hat and tails.

The Aristocrat of Filters

Push button control — Smooth power retraction of tank — No breaking of pipe connections — Self sealing cover gasket — Complete plate drainage — are a few of the superior features of the Sparkler Model MCR Filter. The top hat quality in heavy duty diatomite filters.

SPARKLER VERTICAL PLATE FILTERS
TOP HAT QUALITY

Heavy oils, primary filtration of beer, heavy chemicals, and other products with a high bulk residue, are easily and speedily filtered in the Model MCR filter with highly satisfactory results.

The advanced, ultra modern operating features of the MCR filter make it the aristocrat of heavy duty filters. Old conceptions of filtering high bulk products must be revised in the light of this new filter development. Everywhere the MCR filter has been installed filtering costs have dropped materially.



Retractable Tank Model MCR filter available in capacities from 100 sq. ft. to 2000 sq. ft. of filtering surface.

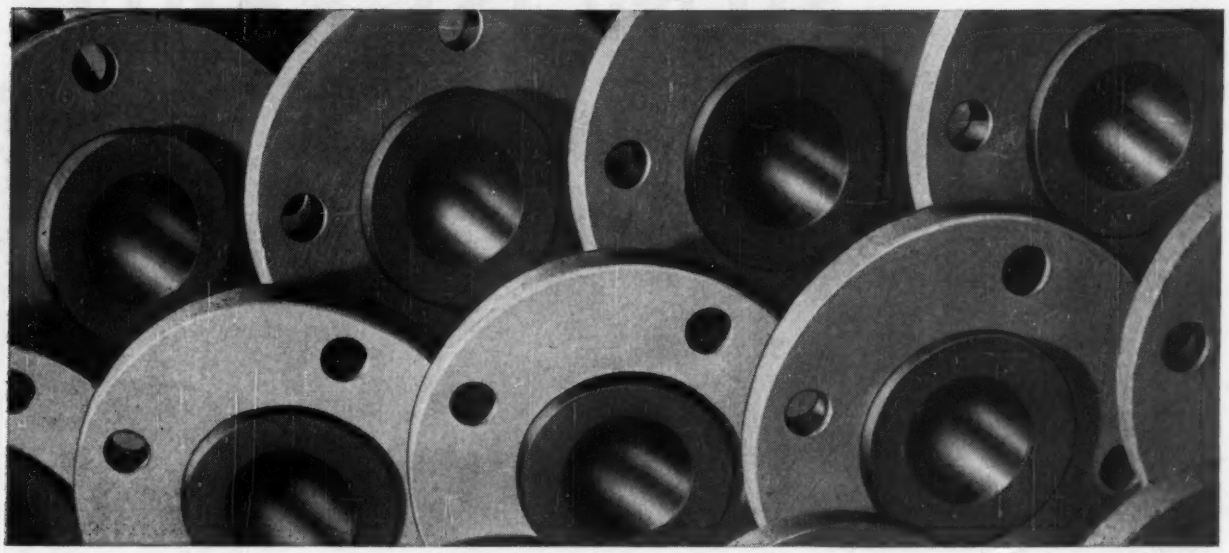
Write Mr. Eric Anderson for personal engineering service on your filteration problem

SPARKLER MANUFACTURING CO.

MUNDELEIN, ILL. • Sparkler International Ltd. • Plants at, Galt, Ontario, Canada; Amsterdam, Holland.

For over a quarter of a century, engineers and manufacturers of a complete line of industrial filtration equipment.

DOW



You can see why

SARAN LINED PIPE

GIVES LONG, TROUBLE-FREE SERVICE

It's made of corrosion-resistant saran pipe swaged into steel for extra rigidity and strength . . . cuts downtime losses conveying corrosive liquids.

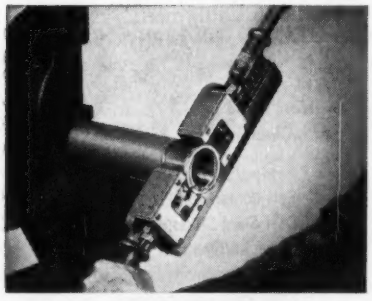
Now you can convey chemicals and many other corrosive liquids without worrying about costly shutdowns due to corrosion. For saran lined pipe, fittings and valves are corrosion-resistant . . . form snug, leakproof joints . . . won't burst under pressure.

They're easily and inexpensively installed because they can be cut and threaded in the field with any standard pipe fitter's tools. Their rigidity means that few supporting members are needed.

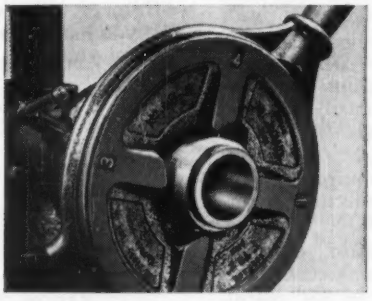
Saran lined pipe, fittings and valves have a proved record in industry of bringing long trouble-free service. If your operation requires superior resistance to most chemicals and solvents, be sure to investigate saran lined pipe. Contact the Saran Lined Pipe Company, Department SP527A, 2415 Burdette Avenue, Ferndale 20, Michigan.

RELATED SARAN PRODUCTS—Saran rubber tank lining • Saran rubber molding stock • Saran tubing and fittings • Saran pipe and fittings.

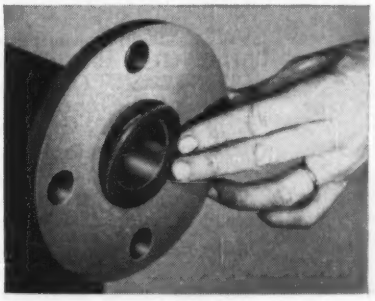
Saran Lined Pipe Can Be Fabricated Right in the Field!



A Beaver Cutter cuts away the end of the steel pipe so that 5/16" of the saran lining is extended. This assures a tight seal after a flange is applied and connected with another flange.



A ratchet type thread cutter makes the standard threads after the Beaver Cutter has been used. A flange is then attached and the saran liner filed so its ends are flush with the flange.

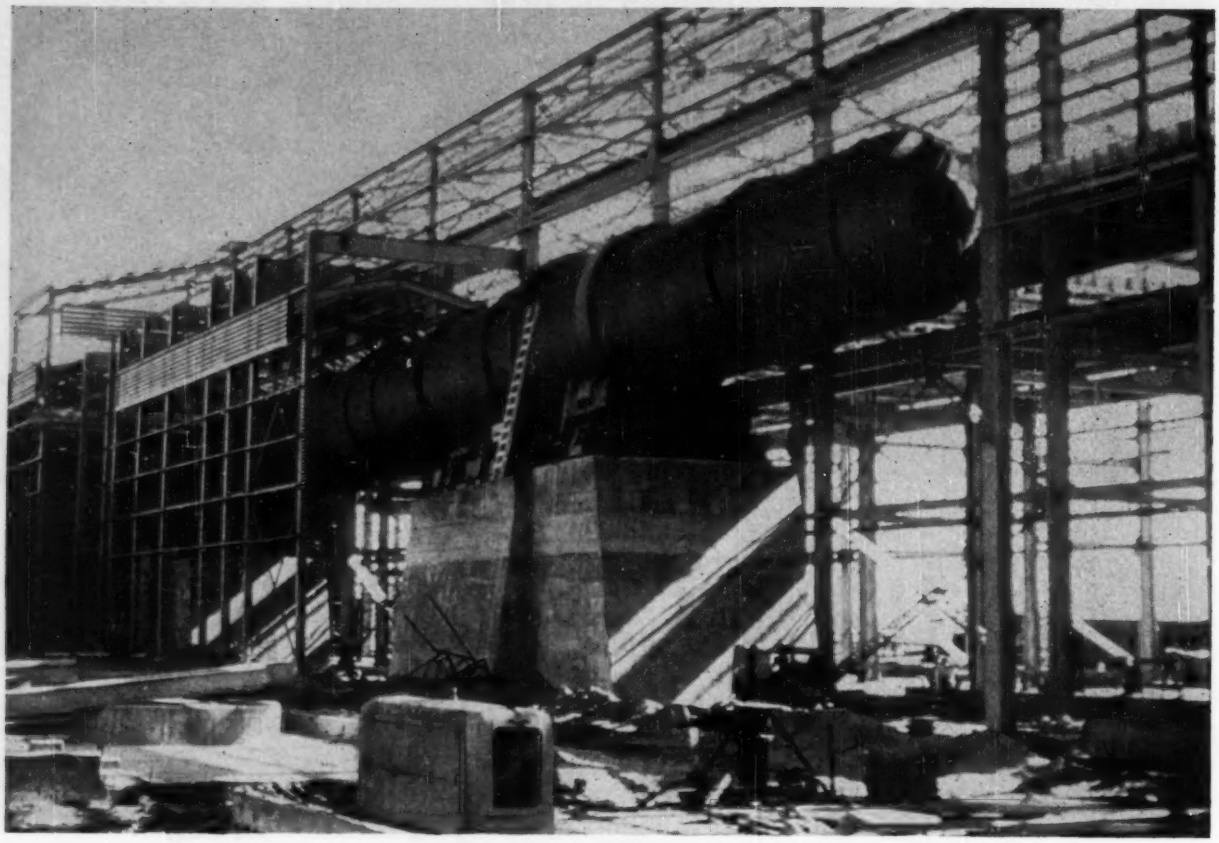


A half gasket is used in each flange or whole one can be used in one of the flanges. Then the flanges are joined. The resulting joint is snug, completely airtight and leakproof.

Saran Lined Pipe is Manufactured by The Dow Chemical Company, Midland, Michigan

you can depend on DOW PLASTICS DOW

ALMOST READY



and RARIN' TO GO

And once it starts, it will keep on for years and years . . .

The VULCAN KILN shown above is mammoth, and some idea of its size can be gained by comparison with the ladder resting against it. This kiln is 12′ x 175′ and is the largest ever made in the United States for the production of titanium oxide.

VULCAN equipment that has been installed, other than the kiln shown above, is a 12′ x 22′ VULCAN combustion chamber; automatically lubricated, and easily adjusted supporting and roller bearings; latest type drive machinery.

Every bit of the pictured equipment was designed, built and the installation supervised by THE VULCAN IRON WORKS.

If you are planning to build, contact VULCAN of Wilkes-Barre. VULCAN's manufacturing facilities are of the latest, their Engineering Department is fully staffed to offer you answers to any of your problems. Their 106 years of continuous business means experience. You can benefit by this experience in constructive suggestions and preliminary drawings—without obligation (as far as possible). Write today for Bulletin A-422 on Rotary Kilns, Coolers, Dryers, Retorts, and other dependable equipment. If you have a problem, VULCAN will gladly assist you.

Any information on items listed below will be sent to you immediately:

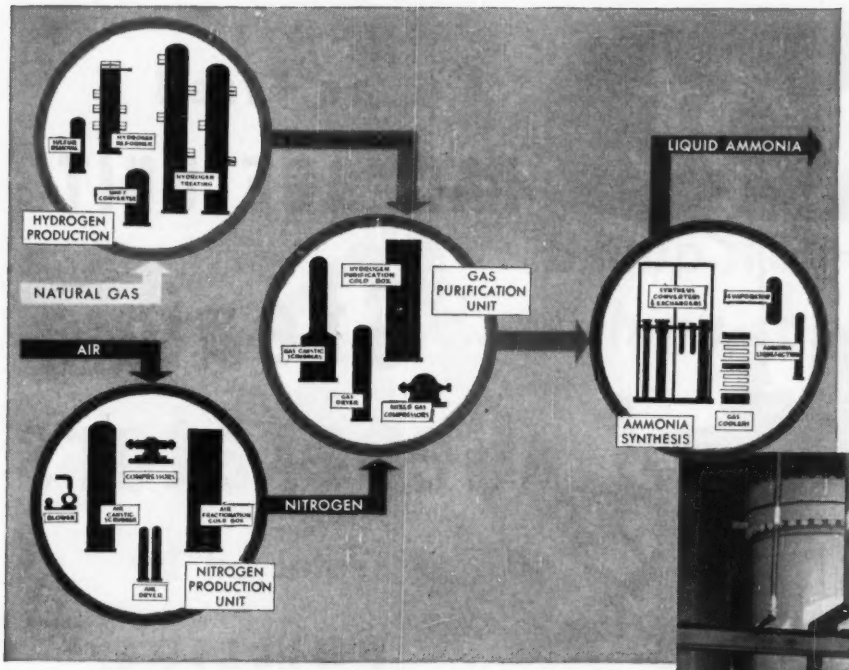
- Rotary Kilns, Coolers and Dryers
- Rotary Retorts, Calciners, Etc.
- Improved Vertical Lime Kilns
- Automatic Quick-Lime Hydrators
- Briquetting Equipment
- Open-Hearth Steel Castings
- Heavy Duty Electric Hoists
- Self-Contained Electric Hoists
- Cast-Steel Sheaves and Gears
- Diesel Locomotives
- Electric Locomotives and Larrys
- Steel Plate Fabrications
- Hydraulic Presses

VULCAN IRON WORKS

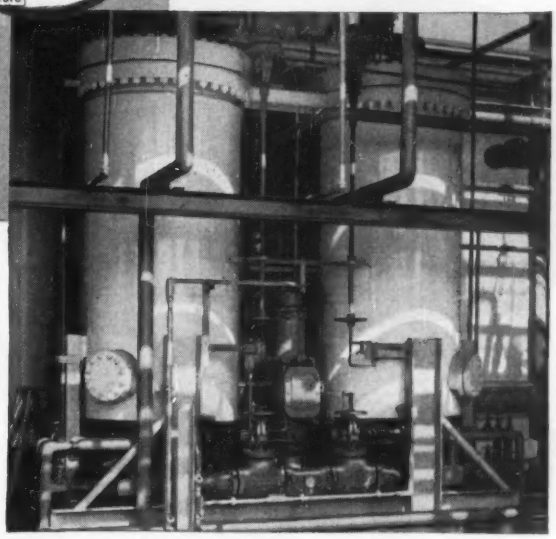
NEW YORK OFFICE
50 CHURCH ST., N.Y., N.Y.

WILKES-BARRE, PA., U.S.A.
ESTABLISHED 1849

CABLE ADDRESS
"VULWORKS WILKESBARRE"



Air and natural gas are synthesized to form liquid ammonia, as indicated by this Brea Chemicals flow-chart. Two Lectrodryers like that below dry incoming air to a moisture content of 1/10,000 per cent, or lower.



How LECTRODRYERS prevent process freeze-outs at BREA CHEMICALS, Inc.

A freeze-out occurs when moisture-laden air or other wet gas enters a heat exchanger to be liquefied. As the air chills, the moisture condenses, freezes and forms rime ice. With a Lectrodryer* in the process, freeze-outs are prevented without interrupting production.

Brea Chemicals keeps this liquid ammonia process humming with two giant Lectrodryers drying all incoming air to a moisture content of one part in a million. So little moisture gets by that de-icing is required only two or three times per year.

If moisture is your problem, regardless of the process involved, a Lectrodryer is the solution. Lectrodryers provide dehumidification or dryness according to the specific need, even to dewpoints as low as -100° F. Lectrodryers are built to handle pressures as high as 6000 psi. They may be automatic or manually controlled.

Write for *Because Moisture Isn't Pink,* which describes industry's use of Lectrodryers. Request engineering information. Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

* REGISTERED TRADEMARK U.S. PAT. OFF.

Vogt

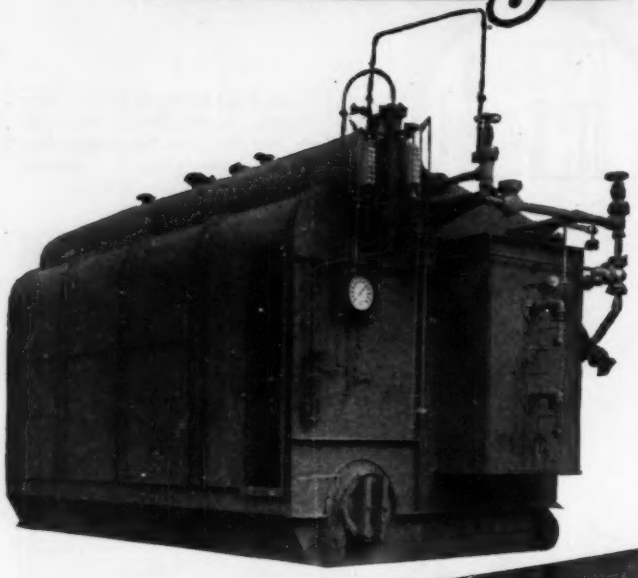
Gas Fired PACKAGE UNIT

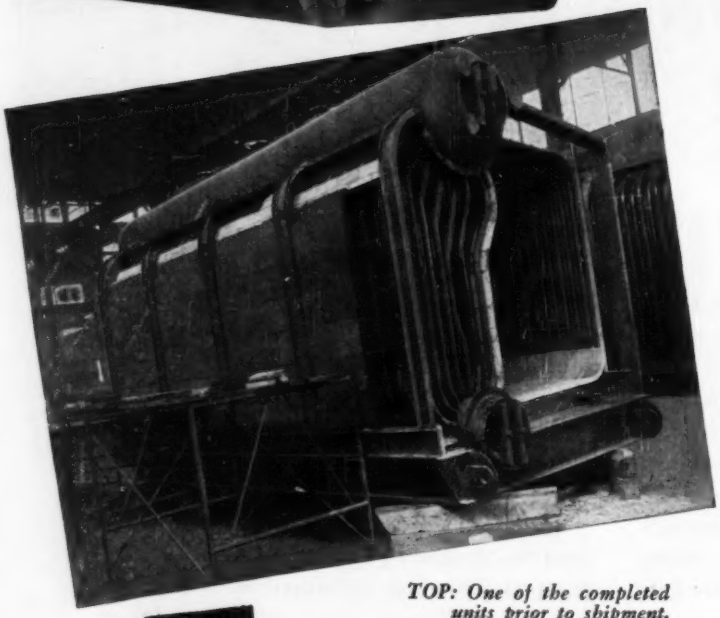
Steam Generators

selected by

PHILLIPS CHEMICAL CO.

Pasadena, Texas Plant





TOP: One of the completed units prior to shipment.

BOTTOM: Shop erection view shows tile and block insulation in convection wall; also main baffle tile and furnace floor tile.



Principal Data, Each Unit

25,000 pounds steam per hour capacity. Induced draft type.

Fusion welded steam and water drums designed for 425 pound S.W.P.

Completely shop assembled and required only the piping and gas outlet connections to place them in operation.

Fully steel encased for outdoor installation on a simple foundation.

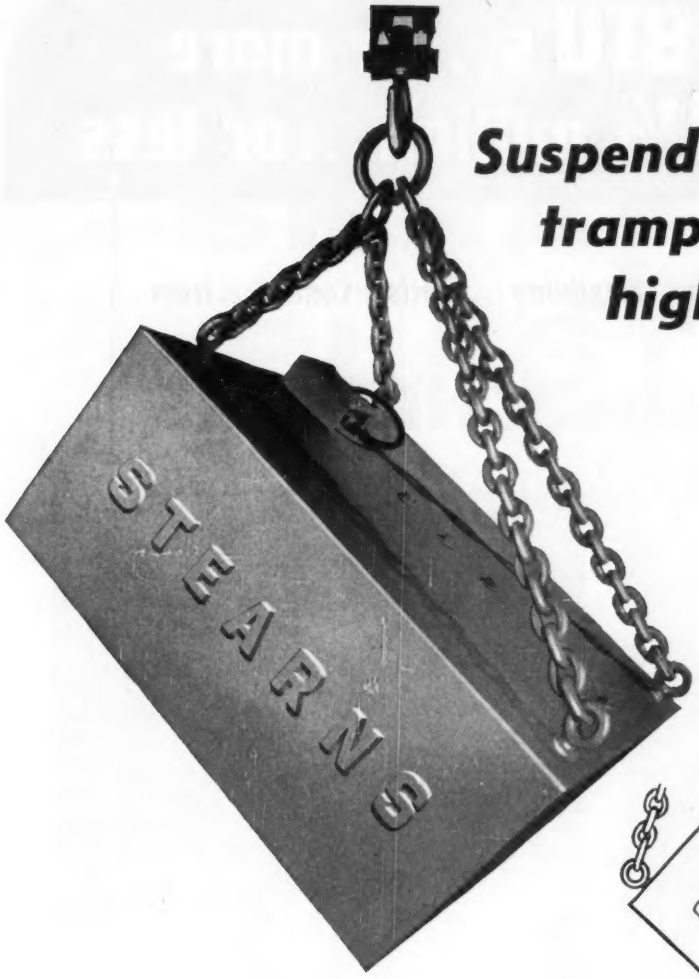
•

* *Vogt Steam Generators are available in bent tube types and straight tube forged sectional header types for solid, liquid or gaseous fuels. Bulletins on request.*

HENRY VOGT MACHINE CO.

Louisville, Kentucky

BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.



Suspended magnet solves tramp iron problem on high-speed conveyor handling wet or dry material

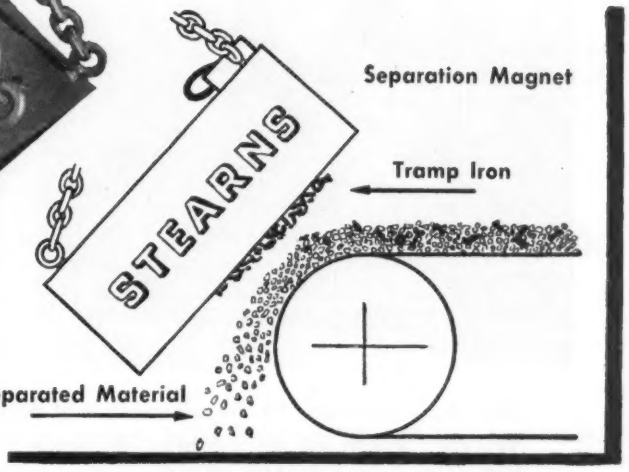


Diagram showing Stearns suspended magnet positioned over head pulley.

Stearns rectangular suspended separation magnet cures tramp iron headaches on fast-moving conveyors, particularly when material is wet.

First, the magnet's length permits its powerful, deep pulling force to work over a large area . . . dig out embedded tramp iron . . . prevent "sneak throughs." Second, the upward movement of iron to the magnet, shakes off wet, clinging material, eliminating costly waste.

Greater Flexibility

Stearns suspended magnet overcomes space limitations because it can be placed over the head pulley, or anywhere along the belt. Sometimes it's set up to remove tramp iron before material moves onto the conveyor — thus safeguarding the belt from damage. In many processing operations, Stearns suspended magnets are used ahead of magnetic pulleys to insure double protection for crushers and other expensive equipment.

Custom-Built

Magnetic specialists at Stearns design and build rectangular or circular suspended magnets, electro or permanent magnetic pulleys in standard sizes, or to your individual specifications. Get complete details from your Stearns representative or write for bulletin 25D.

Check these advantages

- All-welded, moisture-proof construction
- No moving parts that require replacing
- Single coil construction for magnetic field stability
- Leads and terminals fully protected against abrasion
- Vacuum-impregnated windings for long life, dependable operation

1115

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

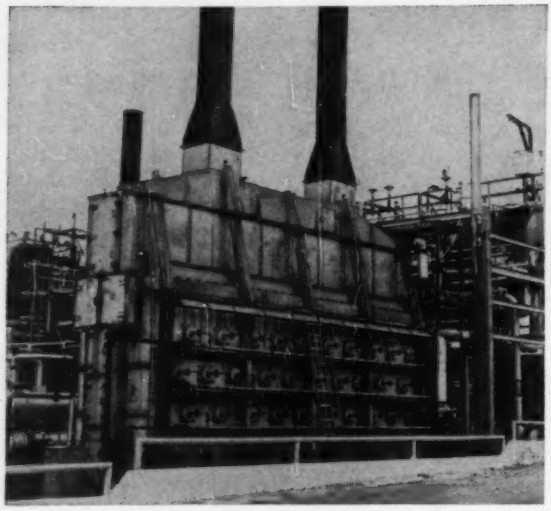
STEARNS MAGNETS

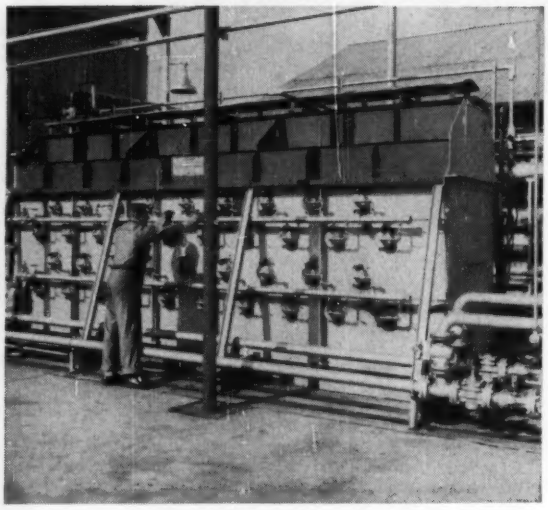
STEARNS MAGNETIC, INC.; 629 S. 28th St., Milwaukee 46, Wis.

35 MILLION BTU's...or more
1½ million...or less

The Same Uniform Heating...Flexibility...Precise Control...from

SELAS *Gradiation* HEATERS





Size is no limitation to the advantages of Selas radiant heaters and Zone Control.

Whether processing petroleum or chemicals . . . for pilot plant or volume production . . . Selas Gradiation heaters offer the following desirable features:

- Compact heating units with multiple coils and absolute temperature control in a single radiant chamber.
- Flexibility in shaping the heating curve.
- Complete combustion with little or no excess air.
- Prolonged tube life—lower maximum tube wall temperature, through more uniform circumferential heat distribution, minimizes corrosion rate.

Selas Gradiation heating offers new possibilities in every petroleum or chemical plant where heat processing is a precise operation.

Send for informative bulletin on selection of heaters for petroleum and chemical processing.

SELAS FLUID PROCESSING

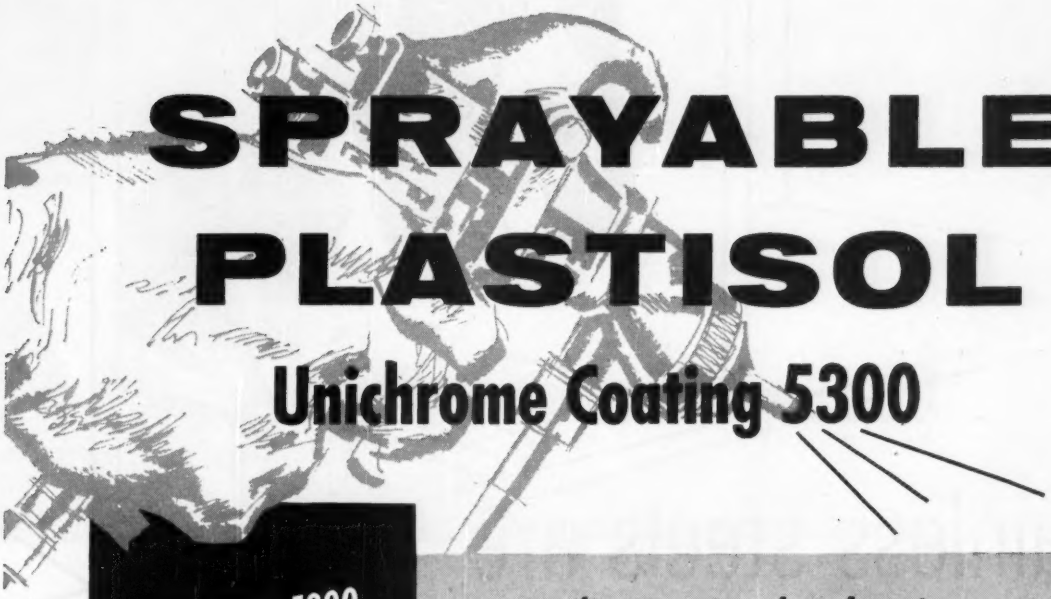
SELAS

CORPORATION OF AMERICA • PHILADELPHIA 34, PA.

New corrosion-control "tool"...

SPRAYABLE PLASTISOL

Unichrome Coating 5300



COATING 5300 PROVIDES . . .

- *a resilient coating that doesn't crack, chip or tear*
- *.020" of pore-free protection per coat*
- *seamless, continuous heavy coatings*
- *chemical resistance of vinyls*

Any metal surface that can be sprayed and uniformly baked can now be strongly protected against severe corrosive conditions with the first practical, spraying plastisol—Unichrome Coating 5300.

This versatile coating offers many advantages over paint and ordinary protective coatings. With Coating 5300, you can apply chemical-and abrasion-resistant films as thick as .020" with a *single* spray application. That's 5 to 20 times thicker than ordinary coatings. In fact, multiple sprayed coats of this new material build films as thick as many sheet lining materials – and at less cost.

Unichrome Coating 5300 offers seam-free and pore-free protection against acids, alkalies, water, salt solutions and many other corrosive agents. It levels surface irregularities, and together with its heavy build-up, eliminates weak spots where corrosion might ordinarily break through. A vinyl material with 100% solids, it bakes into a resilient coating that resists abrasion, chipping and cracking.

Here is a new and better way to protect interiors, exteriors of tanks, ducts and other large equipment from corrosion. If your plant lacks baking facilities, there are conveniently located jobbers in most sections of the country who can apply Coating 5300 for you.

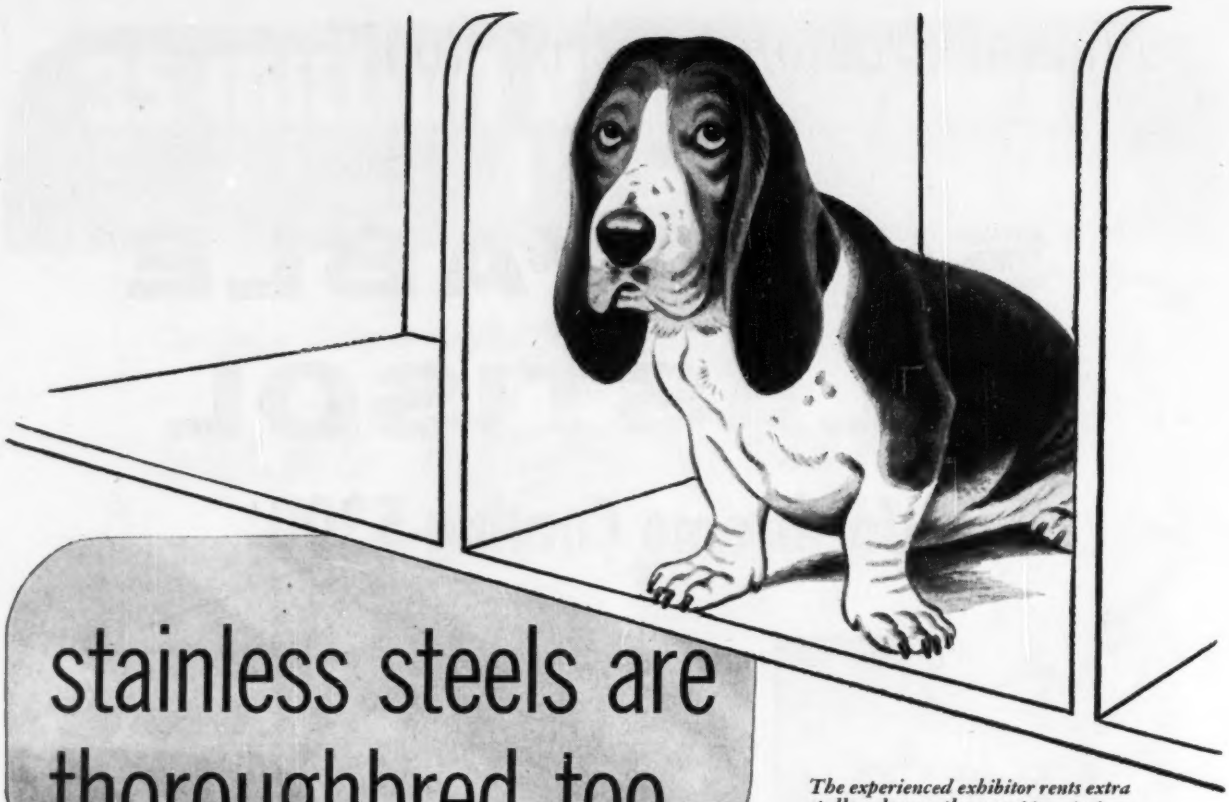


MORE INFORMATION on Unichrome Plastisol Compounds presented in Bulletin VP-1. Send for it.

UNICHROME Trade mark **COATINGS FOR METALS**

UNITED CHROMIUM, INCORPORATED

100 East 42nd Street, New York 17, N. Y.
Detroit 20, Mich. • Waterbury 20, Conn.
Chicago 4, Ill. • Los Angeles 13, Calif.
In Canada: United Chromium Limited, Toronto 1, Ont.



stainless steels are thoroughbred, too

The experienced exhibitor rents extra stalls... leaves them empty... to prevent contamination of his thoroughbred pets by canine neighbors.

To develop their best qualities demands *exclusive* care. That is why Sun Ship's new Alloy Products Shop has been planned for the *exclusive* fabrication of stainless and alloy steel products. When you have selected from the many available Alloys a stainless steel best suited for your service condition, you have done only half the job. You must also provide for the best possible fabrication if you are to have full protection—"A Thoroughbred Job."

Why entrust stainless steel to be fabricated in the same shop where carbon steel products are fabricated, and subject this precious metal to contamination with iron fragments, dust, or other harmful elements? A segregated shop is your answer.

Sun Ship now operates an all-alloy shop, one especially built and equipped for fabricating stainless and alloy products as they should be—segregated from carbon steel fabrication.

We emphasize the fabrication of medium and heavy stainless, alloy and aluminum products for industry.

Try Sun Ship for stainless fabrication as it should be done.

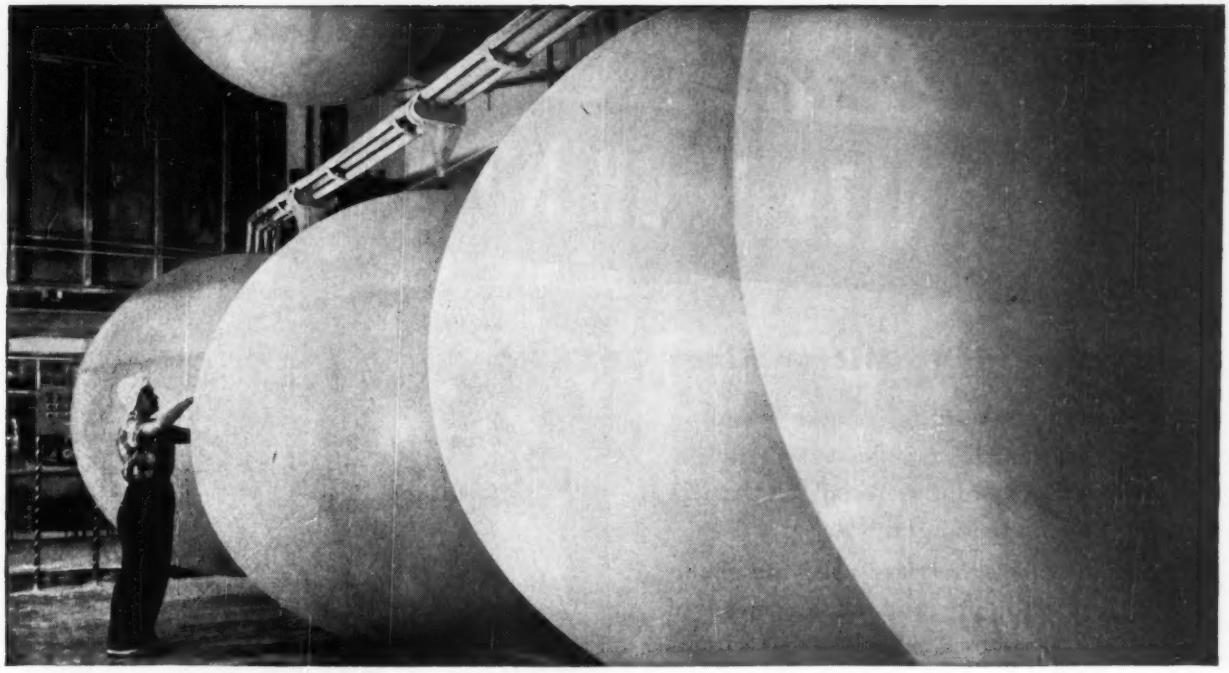
Our Sales Engineering Department will be pleased to assist you with any of your fabrication problems.

Sun Ship also makes all types of carbon steel pressure vessels.

ALLOY PRODUCTS SHOP

OF Sun SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE • **CHESTER, PA.** • 25 BROADWAY, NEW YORK CITY



WEATHER BALLOON MAKER SAVES $2500 A YEAR WITH KATHABAR EQUIPMENT

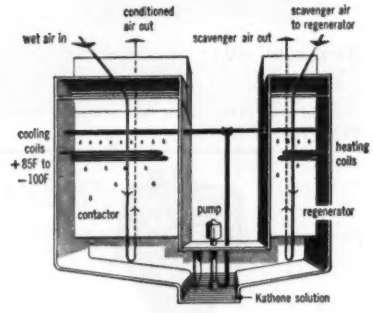
Kathabar humidity conditioning provides the right weather for making weather balloons. The Dewey and Almy Chemical Company obtains 40-grain air without frost, expensive over-cooling and re-heating, or duplicate coils. The system's coolant is 75°F water. *Results:* annual saving of $2500 in operating costs—and faster production of their balloons.

Here's how their two-zone system works. In the first zone, ground level, latex balloon gels are inflated from one-fourth to full size. Moisture between latex particles is a necessary lubricant during gel inflation. The maintained air conditions average 70°F, 50% RH.

Second zone, an 80-foot drying tower, is held at 100°F and 20-30% RH for final drying. The moisture must be removed at a controlled rate—not too fast or the balloons rupture; not too slow or production is impeded. Temperatures over 100°F would cause a spotty pre-cure.

This is a typical example of how Kathabar humidity conditioning has solved industrial air conditioning problems for 20 years. Your Kathabar system representative can show you how to dictate *your* production weather. As a trial balloon, write for Literature Group K54-2.

WHAT COULD BE SIMPLER?



Air to be conditioned passes through the contactor, where an absorbent solution removes moisture (the amount depends on the automatically-controlled temperature of the solution). In the automatic regeneration, about 15% of the solution is heated, and the moisture it releases is blown out the window.

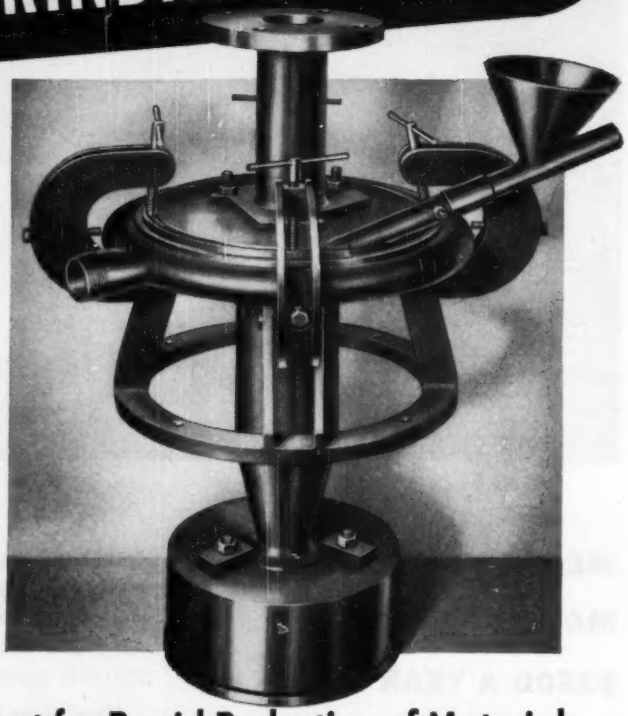
Kathabar®
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES *Janitrol* AUTOMATIC SPACE HEATING

Sturtevant

MICRONIZER* GRINDING MACHINE



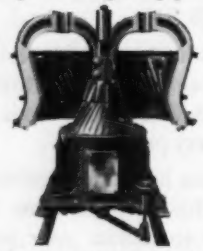
Reduces Solids to Micron Sizes

The new Sturtevant *Micronizer* grinding machine is a fluid jet grinder especially designed to reduce solid materials to particle sizes in the micron ranges.

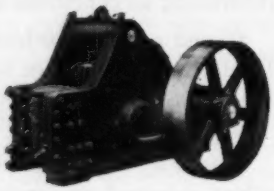
Sturtevant *Micronizers* are used for simultaneous dry grinding and classification of solids. The variety of materials that can be processed is large and includes both metallic and non-metallic minerals and ores, metals, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes and numerous other organic and inorganic products. Available in capacities from ½ to 3000 pounds per hour.

Other Sturtevant Pulverizing Equipment for Rapid Reduction of Materials...

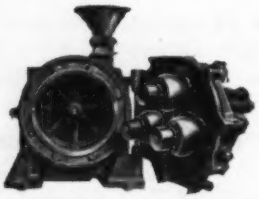
Especially Applicable for Initial Grinding of Products for the Micronizer Mill



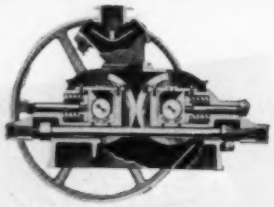
ROTARY FINE CRUSHERS for intermediate and fine reduction (down to ¼"). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers.



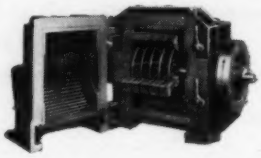
JAW CRUSHERS for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.



RING-ROLL MILLS for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



CRUSHING ROLLS for granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



SWING-SLEDGE MILLS for coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.



AIR SEPARATOR for separation of fines to 325 mesh and finer. Increases output from 25% to 300%... lowers power costs by 50%. Capacities ¼ to 50 tons per hour output.

*Registered trademark of the Sturtevant Mill Company

STURTEVANT MILL COMPANY

100 CLAYTON STREET, BOSTON 22, MASS.

DESIGNERS & MANUFACTURERS OF DENS AND EXCAVATORS • MIXERS • SCREENS • PULVERIZERS • ELEVATORS • AND COMPLETE FERTILIZER UNITS

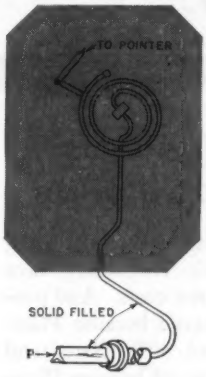
How to measure Pressure of

HOT, VISCOUS LIQUIDS

THE only simple, economical way we know to measure the pressure of viscous liquids at temperatures as high as 750°F.—and particularly those that solidify at atmospheric temperatures—is to use one of the Taylor Volumetric Pressure instruments shown below. These completely sealed systems are ideal for viscous or corrosive liquids or liquids with suspended solids that you just can't measure with a conventional open pressure system. They're good for pressures from 0 to 15,000 lbs. at temperatures as high as 750°F. (650° for continuous service). They can't clog, because only a flexible, corrosion-resistant diaphragm or a fluted bulb are in contact with the fluid to be measured. The ability of these instruments to measure pressure at such high temperatures is a Taylor specialty. Available as indicators, recorders or controllers. Call your Taylor Field Engineer for full details on how they can be applied to your pressure measurement problems.

Taylor Instrument Companies, Rochester, N.Y., and Toronto, Canada.

HIGH PRESSURE AT HIGH TEMPERATURE



For pressure ranges as high as 0-15,000 psi or as low as 0-600 psi with temperatures to 750°F., (650° for continuous service). Newly designed fluted bulb is highly responsive. All parts exposed to process are of welded stainless steel construction. Tubing lengths up to 50 feet.

LOW PRESSURE AT HIGH TEMPERATURE



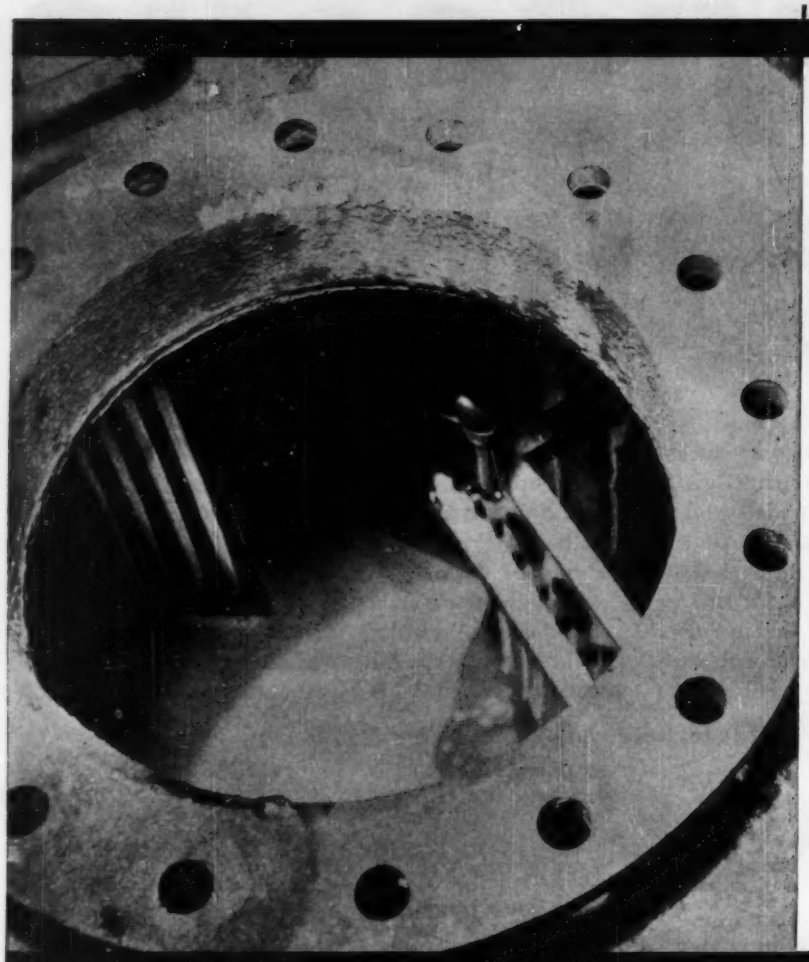
For pressure ranges up to 0-600 psi or down to 0-25 psi with temperatures as high as 750°F., (650° for continuous service). Diaphragms available in stainless steel, copper, monel, silver or tantalum. Tubing lengths to 150 feet.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

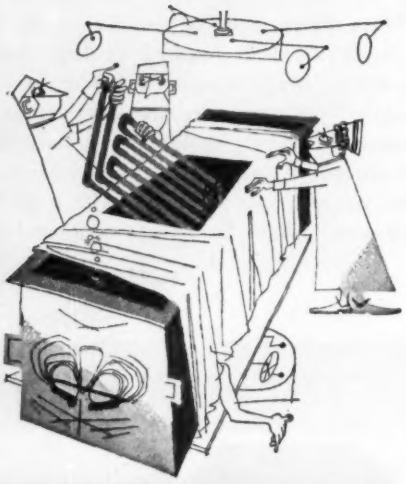
Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

new PLATECOILS®

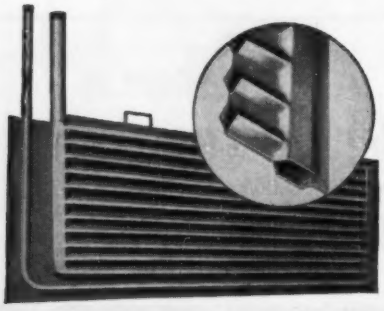
cost less than pipe coil repairs...



as Coil-itis* is cured in this Sherwin-Williams agitated tank



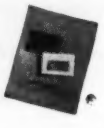
Platecoils have replaced a large circular pipe coil formerly used to cool alkaline slurry in an agitated tank at Sherwin-Williams Company. Installed on end, Platecoils are inserted or withdrawn through a manhole on the top of the tank. With pipe coils, it was necessary to remove the motor and agitator and the bolted-down tank top to make repairs. Cost of doing this just once exceeded the total cost of the 6 Tranter Platecoils now used. In addition, cooling is now accomplished without fouling of surface, which means the cooling is more effective and maintenance is decreased. Such outstanding savings are possible with Platecoils. Investigate them for your processes today. For heating as well as cooling, Tranter Platecoils are your best answer.



PLATECOILS replace pipe coil for 50% of the cost

*Besides reducing original costs, Tranter Platecoils frequently save 50% in maintenance costs. And production time is saved because Platecoils heat or cool 50% faster and payloads are increased because Platecoils take 50% less tank space. By overcoming the limitations of old-fashioned pipe coils, Platecoils cure Coil-itis.

Write today for a 12-company report on savings made by use of Tranter Platecoils. Ask for Bulletin No. P61.

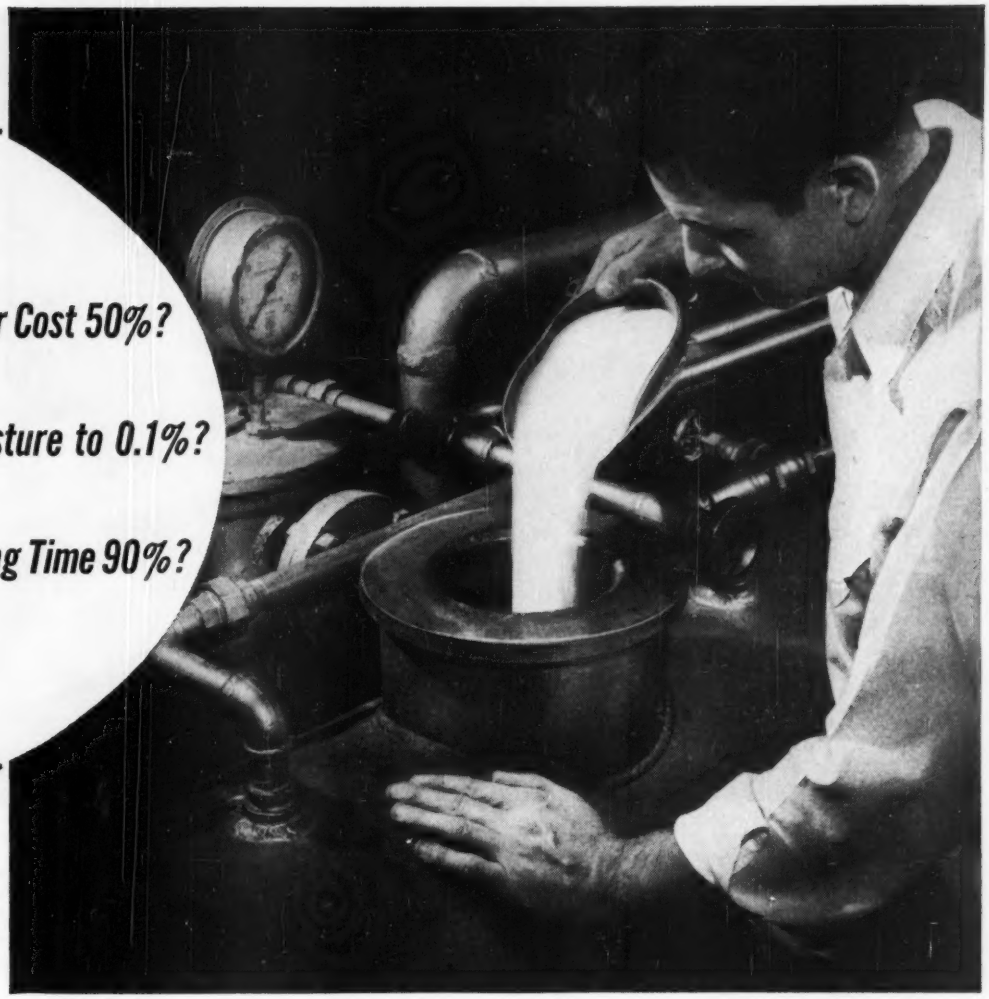


PLATECOIL Div. TRANTER MANUFACTURING, Inc., Lansing 4, Michigan

What Cuts Labor Cost 50%?

What Cuts Moisture to 0.1%?

What Cuts Drying Time 90%?



Operator loads Rotary Vacuum Dryer in Stokes pilot plant.

Labor and time are reduced 50% by vacuum drying of a mixture of acetyl salicylic acid and other chemicals.

Sodium trichloracetate is reduced from 35% to 0.1% moisture content in 8 to 12 hours by vacuum drying.

Several makers of powdered aluminum and brass avert fire and explosion hazards by drying powders and solvents in vacuum . . . then recover 99% or more of the solvent in the same process.

Shellac is dried in vacuum in 6 to 8 hours per batch, a job that formerly took 72 hours!

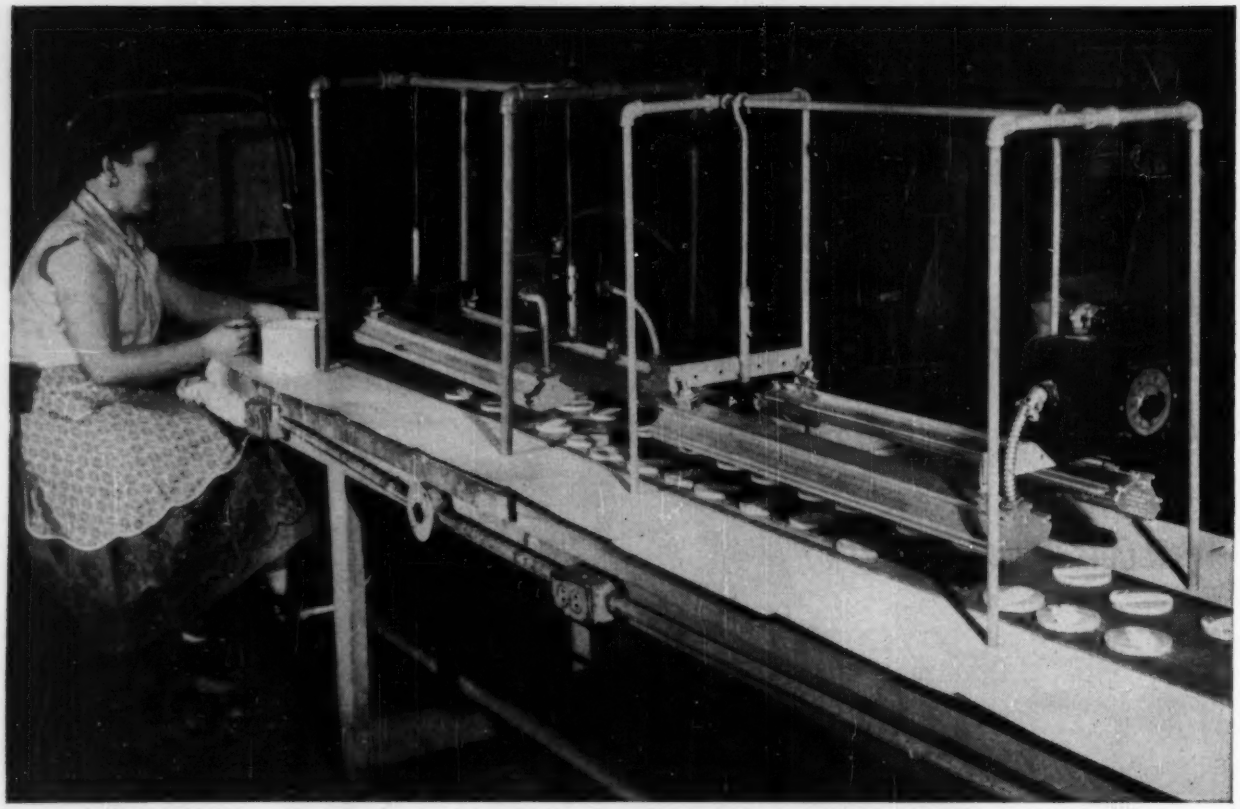
Stokes has the laboratory and pilot plant facilities to test vacuum drying of any product which offers drying difficulties. Methods, cycles, equipment, costs will be accurately determined. Stokes has 40 years' experience in vacuum technology to share with you on drying problems.

Send for an informative brochure, "Vacuum Drying," on the techniques of moisture removal from chemicals, pharmaceuticals and other industrial products.

F. J. STOKES MACHINE COMPANY
PHILADELPHIA 20, PA.

STOKES

STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages / Industrial Tabletting, Powder Metal and Plastics Molding Presses / Pharmaceutical Equipment



far-infrared heat . . . precisely controlled . . . solves problem of baking paint on plastic

Baking painted designs and lettering on plastic compact cases presented a tough production problem for this company. Too much heat blistered or melted the thermally sensitive plastic material. Too little heat wouldn't bake the paint properly. Added complications were the various bright colors involved.

Four "color blind" Chromalox far-infrared radiant heaters, having a total installed capacity of 7200 watts, provided the answer. The heaters are mounted lengthwise in pairs over the conveyor belt. The long wave length far-infrared radiation heats all colors with practically equal speed . . . and with negligible reflection even from white surfaces. Input controllers for each pair measure out the exact degree of heat required.

Results are rapid, uniform baking of the paint, regardless of the color. Stepped up production without damage to paint or plastic. Low initial investment, low operating and low maintenance costs of the lightweight, portable, all-metal Chromalox radiant heaters.

This problem-solution-result approach has enabled us to help many manufacturers produce better, faster, at lower cost.

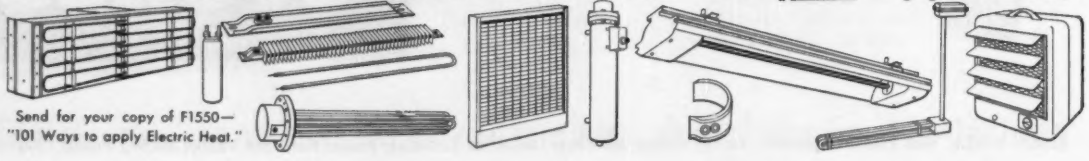
Always available to you are our research, engineering, design and modern manufacturing facilities. The world's largest factory stock of industrial electric heaters plus local stocks at strategic points. And a 33-city nationwide sales-engineering service.

Let us know your problem for controlled heat and we'll go all out to help you find the right answer—electrically.

EDWIN L. WIEGAND COMPANY
7514 Thomas Boulevard, Pittsburgh 8, Pa.



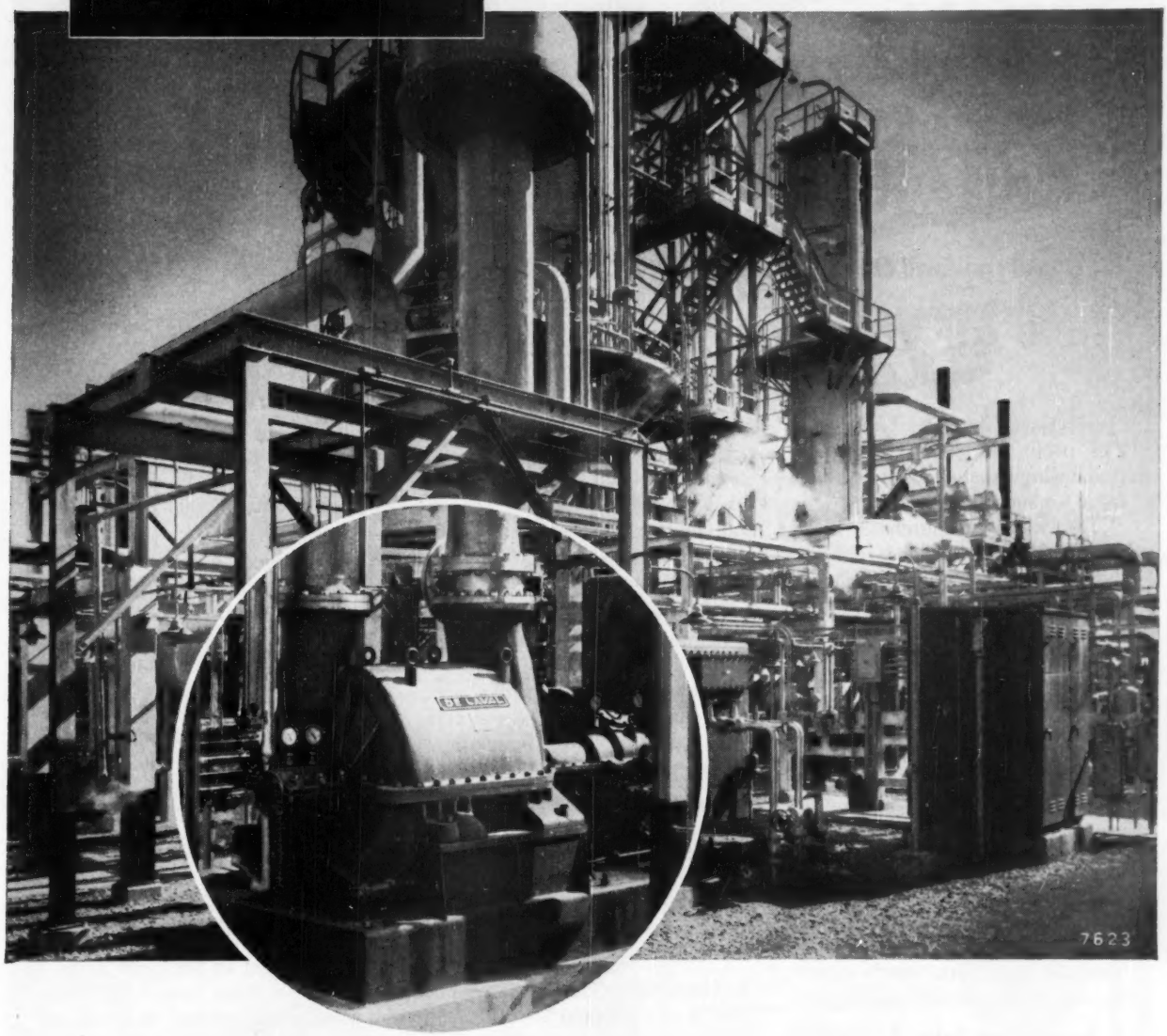
check CHROMALOX electric heat for your application



Send for your copy of F1550—
"101 Ways to apply Electric Heat."

DE LAVAL CENTRIFUGAL BLOWER

delivers 17,400 cfm for Elreco's new cat



This De Laval Centrifugal Blower, on stream at the El Dorado Refining Company's new cat cracker at El Dorado, Kansas, supplies 17,400 cubic feet of air per minute for regeneration of the spent catalyst.

This plant, built in record time of ten months by The Refinery Engineering Company, is designed for a charge capacity of 4,300 barrels per day at 75% conversion. Elreco is another of many refineries which have chosen De Laval for dependable blower performance under heavy-duty, continuous operation. Rugged castings, husky, perfectly balanced rotor and externally mounted, cylindrically seated bearings are design features that reduce maintenance and insure long service. Send for Bulletin 0500 containing complete data.

DE LAVAL *Centrifugal Blowers*

DE LAVAL STEAM TURBINE COMPANY

803 Nottingham Way, Trenton 2, New Jersey

DL 207

A message to CHEMICAL INDUSTRY MANAGEMENT

Here's how you can use

STRATEGIC PURCHASING

to help your company maintain a sound competitive position

As profit margins tighten, your purchasing strategy becomes a vital force for success.

The way you purchase heavy chemicals, for instance, can influence your company's profits in the years ahead.

So it becomes increasingly important for you to seek every possible economic advantage when you select a chemical supplier.

Here, for example, are a few things to look for, when deciding on a source for caustic soda, chlorine, and other chemicals:

1. Supply security. How flexible are your supply lines? For instance, a supplier with plants located on deep water may be able to offer you a choice of rail or water delivery. This can insure you steady supply, in case of rail service interruption.

2. Engineering help. A supplier's engineering staff can often be valuable to you when you are setting up a new chemical process or caustic and chlorine handling systems—not only with advice, but with actual design assistance.

3. Smooth processing. You'll find it helpful to work with the supplier's technical service men who visit you periodically. Often these men can spot potential problems and ward them off before they cause you trouble.

4. Safety programs. Your men can benefit from safety suggestions offered by your supplier. You should have on tap the latest in safety equipment, plus up-to-date information on safe handling of chemicals.

5. Economy. Choose a supplier who wants to help you cut your operating costs; who will go all the way with you in arriving at the best, most advantageous method of shipping and handling for your conditions.

6. Experience. Above all, choose a supplier who is familiar with your industry. It takes years of experience to acquire an understanding of the problems you face, and the know-how to help you solve them quickly and economically.

Are you getting your fair share of these strategic purchasing advantages?

Many of our customers in the chemical industry feel that they get these advantages in buying from Hooker, a supplier of basic materials to the chemical industry for fifty years.

In the light of the growing importance of these factors, isn't this a good time to review your policies on sources of chemical supply?

HOOKER CHEMICALS

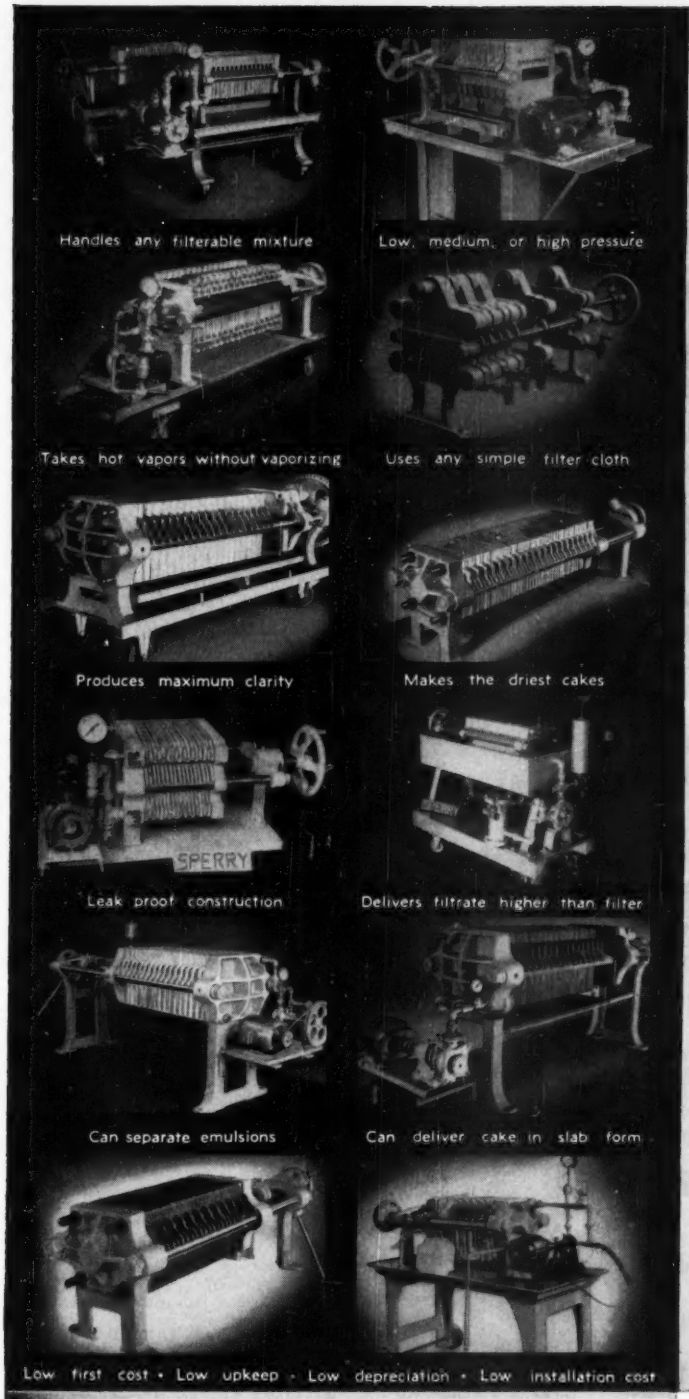
4-1903

1905—Half a Century of Chemicals
From the Salt of the Earth—1955

HOOKER ELECTROCHEMICAL COMPANY

3 Forty-seventh Street, Niagara Falls, N. Y.

NIAGARA FALLS • TACOMA • MONTAGUE, MICH. • NEW YORK • CHICAGO • LOS ANGELES



THOUSANDS of SPERRY FILTER PRESSES

serving **HUNDREDS** of industries . . .

built to **ONE** standard of quality!

In *every* processing industry — *wherever* solids are to be removed from *any* mixture — Sperry Filter Presses are on the job . . . helping to produce products of maximum clarity at low cost. Living proof of the detailed research, custom engineering and standard of quality that has kept Sperry *first in filtration* for three generations.

If you can utilize the significant knowledge gained from this vast experience — consult *Sperry for filtration, today!*

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All types . . . all sizes. Plain or punched to your specifications. Besides cotton and paper, bases are furnished in wool, synthetics, glass, and woven metals.



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Written more as a text and reference manual, this "encyclopedia of filtration data" improves your understanding of a vital process; aids in the selection of the proper equipment for your specific filtration requirements. Write for your free copy of this valuable booklet — today!

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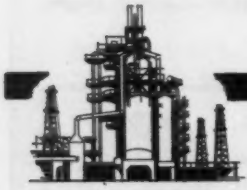


Eye Protection



THE EYES OF TEXAS

Petro-Chemical Workers and Others are Protected with this Gas-Tight AO Rubber Frame Goggle



Wherever gases, fumes and smoke are hazards you'll find this AO 701 Rubber Frame Goggle made for the job. It seals the entire eye area tightly and may be worn over personal glasses. You can rely on this goggle — one of a complete line for industry, made by the world's largest manufacturer of personal safety equipment and ophthalmic devices. Your nearest AO Safety Products Representative can supply you.

QUICK FACTS

Frame molded from non-irritating, acid-resisting neoprene.

Completely gas-tight — no ventilation slots in frame, no hole for strap in lenses.

Acid-resistant bolts and nuts on front of frame.

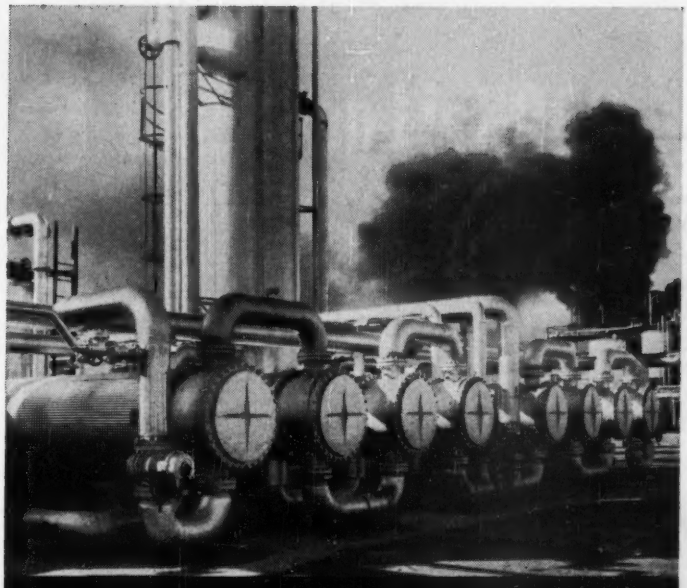
Large vinylite lens conforms to high optical standards, offers exceptional wide-angle vision and is easily replaceable.

American Optical
SAFETY PRODUCTS DIVISION

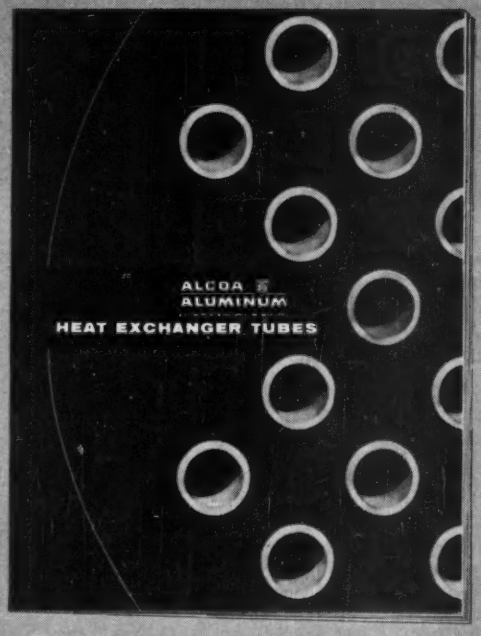
AO SAFETY ZONE

Keep your workers in the Safety Zone with American Optical Safety Equipment

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES



Send for new, free booklet
on cost cutting
ALCOA ALUMINUM HEAT EXCHANGER TUBES



Just off the presses, this booklet brings you all the facts about the latest developments in aluminum heat exchanger tubes. Profusely illustrated with photos, charts and graphs. Provides specifications and estimating data that are the result of ALCOA's more than 30 years' experience with aluminum tubes for condensers and heat exchangers.

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Nominal Composition of Wrought Aluminum Alloys

The general acceptance of aluminum heat exchanger tubes by the process industries has come about for several reasons—the excellent properties of aluminum alloys, ALCOA's cooperative research and development programs aimed at establishing sound applications, and industry's desire for a good product at an economical price.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

ALUMINUM COMPANY OF AMERICA
900-C Alcoa Building, Pittsburgh 19, Pa.
Please send me a copy of your new, free booklet, *Alcoa Aluminum Heat Exchanger Tubes.*

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COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____



don't give fire a fighting chance—
install a Blaw-Knox Automatic Fog System

A single Blaw-Knox Fog Nozzle, shooting its dense, quenching fog into the very heart of a starting fire, can accomplish more than several hose streams each having ten times its capacity.

Controlled by rate-of-rise thermostats, Blaw-Knox Fog Nozzles protect you around the clock, sounding alarms and putting water to work instantly wherever and whenever needed. Their finely divided fog rapidly extinguishes the fire, dissipates heat, prevents development of high temperatures and bursting pressures, confines damage to a small area.

Multiply this kind of fire fighting efficiency in a system engineered to guard against your specific hazard and you are assured of a maximum of protection.

Why not let a Blaw-Knox Fire Protection Engineer study your needs and submit a cost estimate and preliminary layout?

You'll be interested in the new Blaw-Knox booklet, "*Fire Can Destroy Your Business.*" There's no charge. Write for it.

BLAW-KNOX FIRE PROTECTION SYSTEMS CARRY APPROVALS OF ALL INSURANCE UNDERWRITERS • *Deluge Systems* • *Wet Pipe Systems* • *Dry Pipe Systems* • *Water Spray and Fog Systems* • *Rate-of-Rise Sprinkler Systems* • *Foam and Carbon Dioxide Extinguisher Systems*

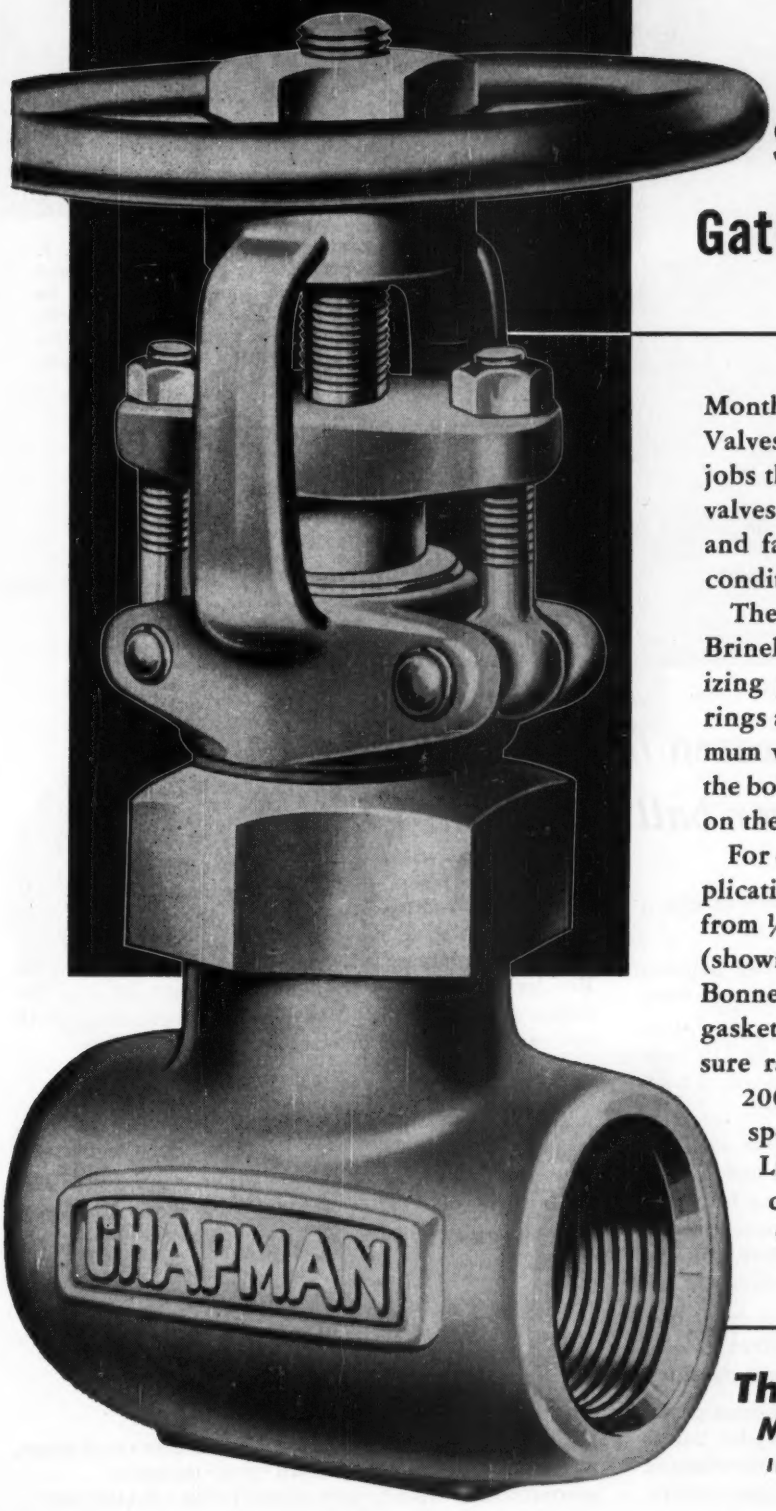
"Little Joey Sprinkler", always on the job



BLAW-KNOX COMPANY
Power Piping & Sprinkler Division
Pittsburgh 33, Pennsylvania

BLAW-KNOX

Chapman List 960



...for EVERY Small Forged Steel Gate Valve Application

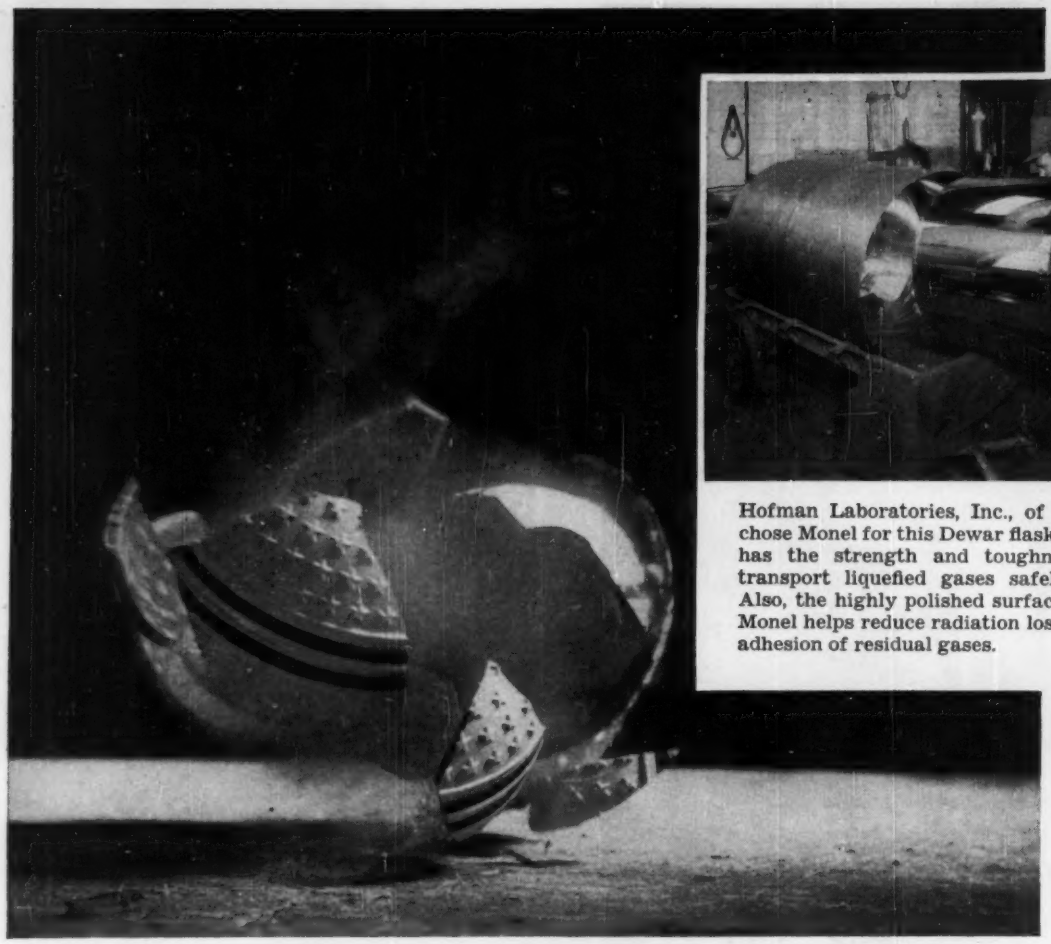
Month after month, Chapman List 960 Valves deliver the goods on more different jobs than any other small forged steel gate valves. And maintenance charges are few and far between even under the toughest conditions.

The wedge gate faces — hardened to 800 Brinell by Chapman's exclusive Malcomizing process — won't seize or gall. Seat rings are hardened stainless steel, for minimum wear, and are easy to replace. Also, the bolted follower has no exposed threads on the yoke to corrode.

For every small forged steel gate valve application, specify Chapman List 960. Sizes from ¼" to 2", either rising stem with yoke (shown) or rising stem with inside screw. Bonnet joint is ground metal-to-metal or gasketed, depending on application. Pressure range is from 380 psi at 1000°F to 2000 psi at 100°F. For higher ratings, specify List 990.

List 960 is made in various alloys and combinations of alloys as listed in Catalog No. 10. Write for your copy today.

The CHAPMAN Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS



Hofman Laboratories, Inc., of Newark, N. J. chose Monel for this Dewar flask because Monel has the strength and toughness needed to transport liquefied gases safely at —330°F. Also, the highly polished surface possible with Monel helps reduce radiation loss and minimize adhesion of residual gases.

Some frozen *food for thought in this rubber ball that didn't bounce!*

At minus 320°F. a child's rubber ball bounces like a flower pot – into pieces.

And what happens to normally soft rubber happens to *most* other materials at extremely low temperatures.

Many metals become too brittle to use. An alloy steel, with a room temperature impact strength of 119 foot-pounds, shows a drop in impact strength to only 6 foot-pounds at the temperature of liquid nitrogen.

One metal, Nickel, withstands and prevents such embrittlement. High nickel alloys like Monel and Inconel keep their toughness – ductility – clear down to within a few degrees of absolute zero. Even the impact properties of weldments are essentially insensitive to temperatures as low as the temperature of liquid nitrogen.

Surprisingly enough, when temperatures drop, Inco Nickel Alloys actually *increase in yield strength and tensile strength without appreciable change in ductility.*

Because of these outstanding low temperature physical properties, Monel and the other Inco Nickel Alloys are used for storing liquefied gases, and for containing and handling many substances at low temperature. Inconel, for example, is used in producing and storing liquid helium. And "K" Monel is used for piston rods and sleeves of compressors for manufacturing liquid oxygen. Besides its good low temperature properties and corrosion resistance, "K" Monel gives the extra strength ordinarily found only in heat-treated alloy steels.

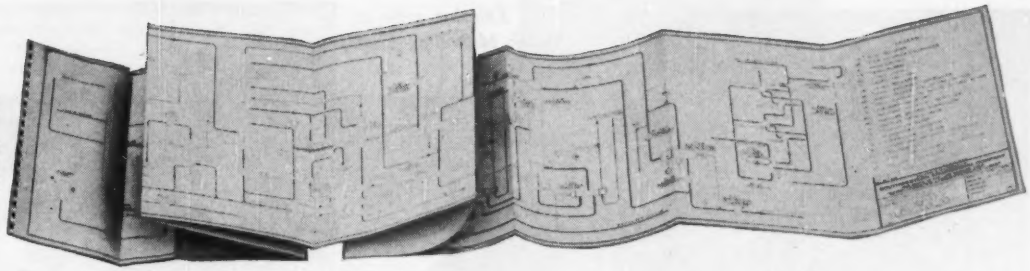
* * *

If you have a low temperature equipment problem, consult engineers of Inco's Technical Service Section. They will gladly help you – without cost or obligation, of course.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

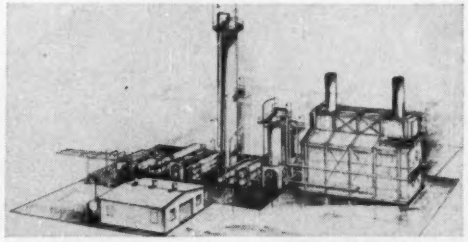
INCO TRADE MARK **Nickel Alloys**

MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL • "S"® MONEL INCONEL® • INCONEL "X"® • INCONEL "W"® • INCOLOY® NIMONIC® Alloys • NICKEL • LOW CARBON NICKEL • DURANICKEL®

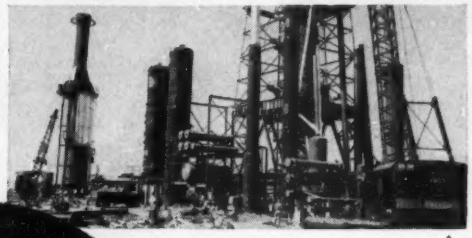


FLOW SHEET DEVELOPMENT
SWECO flow sheet, 9,000 B/D fluid cat cracker

How to get on-stream in record time with upgraded refinery products



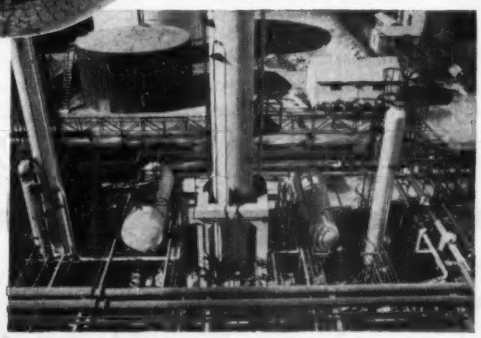
COMPLETE ENGINEERING
SWECO perspective, 5,000 B/D platformer



FIELD CONSTRUCTION
SWECO 6,000 B/D TCC unit, under construction



SHOP FABRICATION
SWECO kiln for 6,000 B/D TCC unit



ON-STREAM
SWECO-built 300 B/D cat poly plant, in operation

Today's demand for maximum output of high octane gasoline and other upgraded products from every barrel of crude oil is literally forcing refiners to install new catalytic process plants. Continued profitable operation may depend on getting on-stream with the new process in a hurry. SWECO's combination of engineering, shop fabrication and field construction is enabling refiners ... in many parts of the U. S. and abroad ... to get new catalytic plants of *assured dependability* in operation fast.

SWECO *is approved by original process developers to engineer and construct plants utilizing the following catalytic processes:*

CRACKING
REFORMING
POLYMERIZATION
DESULFURIZATION
ALKYLATION

If you are planning to install any catalytic process, it will pay you to call on SWECO for a complete engineering-construction proposal.

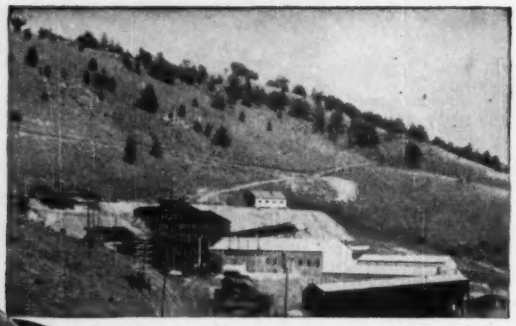
SWECO

Southwestern Engineering Company

Engineers and Constructors
... Manufacturers
Serving the process industries

4800 Santa Fe Avenue
Los Angeles 58, Calif., Dept. CE35
LOgan 8-6262
Cable Address: SWECOLA

SWECO PRODUCTS
Heat Exchangers
Custom fabrication of all types of steel, aluminum and special alloy vessels for the process industries
Screen Separators



Exterior view of Ozark Mahoning Plant

STANDARD-HERSEY countercurrent rotary concentrate dryer

FLUORSPAR CONCENTRATE DRIED TO ALMOST 0% MOISTURE BY A

STANDARD HERSEY ROTARY DRYER

The Northgate, Colorado plant of Ozark Mahoning Co. produces Acid Grade Fluorspar exclusively. Since their flotation concentrator went into production in October of 1952, output has increased to the point where their Standard-Hersey dryer *is now operating at 150% rated capacity.*

The filter cake, produced in Denver equipment, is transported by screw conveyer to a stacking belt for stock piling and sampling, or directly into the 6′ by 50′ Standard-Hersey countercurrent rotary dryer. Moisture in the concentrate is reduced by the dryer from 12-14% to approximately 0% for shipment.

The dryer is lined throughout its length with refractories, as is the dryer furnace. Exhaust gasses at 350°F. pass through a cyclone type dry dust collection system with a balanced airlock arrangement. The temperature of the discharge product is 450°F. Semi-automatic burner controls provide efficient operation of the dryer unit.

The unusually large diameter of the dryer was selected to minimize the velocity of the gas stream through the dryer thus reducing concentrate dust loss to an estimated 1-ton of concentrate per 24 hours.

The engineering staff of the 52 year old Standard Steel Corporation has thousands of successful dryer applications to draw on in solving your problems. Over 30 types of dryers are available to fill almost every drying need in the chemical and food fields.

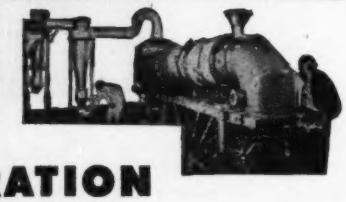
SEND FOR FREE 12-PAGE ILLUSTRATED BULLETIN

Learn how STANDARD-HERSEY has aided manufacturers throughout the world in solving their dryer problems.



COMPLETE PILOT PLANT TAKES GUESSWORK OUT OF DRYING

STANDARD-HERSEY'S pilot dryers play an important part in solving your drying problems *before* blueprint stage.



THE STANDARD FOR 52 YEARS

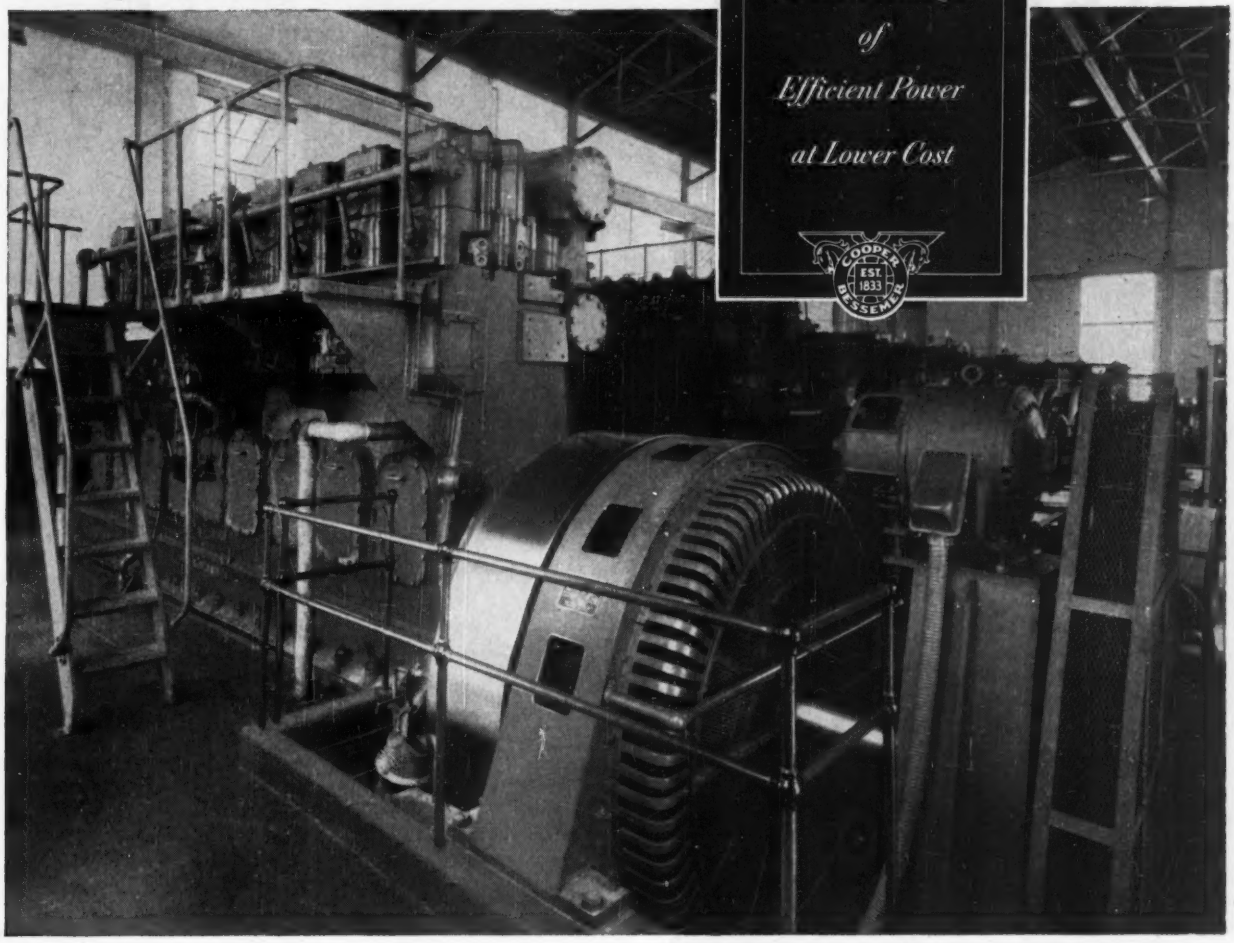
STANDARD STEEL CORPORATION

5005 Boyle Avenue, Los Angeles 58 • 15 Park Row, New York

DF-3

Interior of Hearne's municipal power plant with latest 1715 hp Cooper-Bessemer supercharged Gas-Diesel in foreground. City Manager N. L. McCarver reports that engine's fuel and lube cost averages .00252 mills per kwh.

Another Example of Efficient Power at Lower Cost



BIGGEST TAXPAYER IN THE CITY OF HEARNE

Cooper-Bessemer Gas-Diesel Power!

TO the 4,778 citizens of Hearne, Texas, modern Gas-Diesel power has been a real boon indeed. Not only does their municipal power plant produce 64% of the city's total revenue, but it is largely responsible for low property taxes, a 92-acre municipal park, a golf course, fully equipped club house and a big swimming pool with bath house, to say nothing of street lighting, free school service and other contributory services.

Hearne's base generating load is carried by two Cooper-Bessemer Gas-Diesels — 1000 hp and 1,715 hp units installed in 1947 and 1950 respectively. Fueled mostly by gas, these modern, exceptionally efficient engines last year operated at a fuel cost of only $0.002755 per kwh compared with $0.00465 for older type oil burning engines in 1946.

Says City Manager N. L. McCarver, "We made a good investment in our Cooper-Bessemers. They are not over-rated and will pull their load without the least bit of trouble. The new turbocharged engine is now down for annual check-up and is the cleanest engine we ever saw."

MOUNT VERNON, OHIO

COOPER-BESSEMER

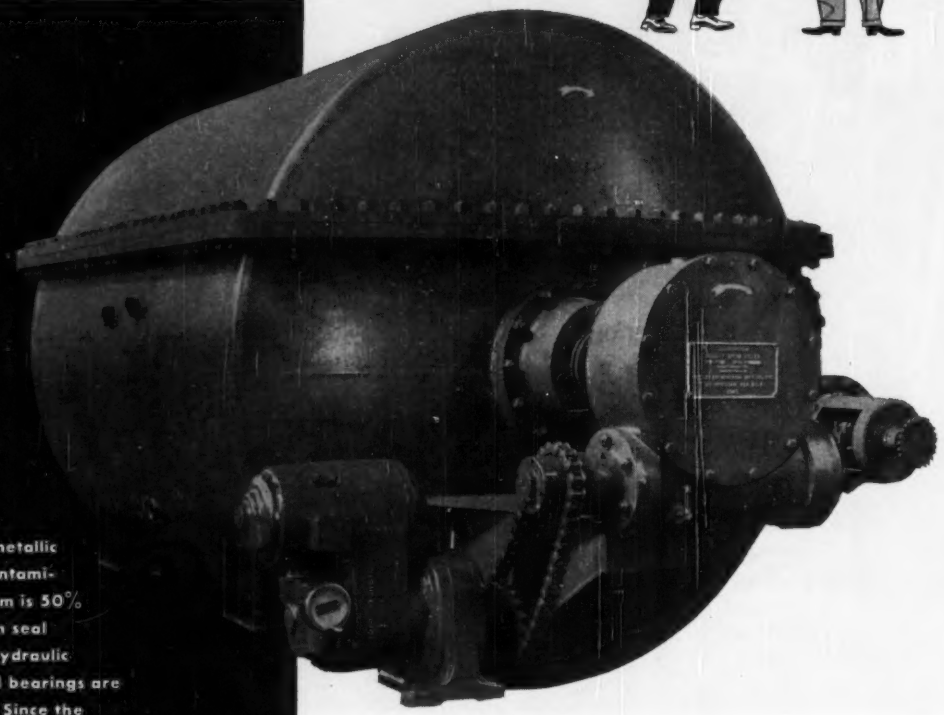
GROVE CITY, PENNA.

New York Washington, D.C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Shreveport St Louis Los Angeles Chicago Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Tulsa Gloucester, Mass. New Orleans, La.

DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS • HIGH PRESSURE LIQUID PUMPS

A Perfect fit





Steel construction throughout, except for special G-B patented bronze locking strip between compartments. Caulking used is a non-metallic compound to prevent contamination of the slurry. Drum is 50% submerged and is held in seal against the valve by a hydraulic mechanism. Bronze lined bearings are lubricated by the slurry. Since the bearings are internal, the filter may be used up to 150 psig. and higher pressures without encountering stuffing box problems. The submergence may be less than 50% and a special sealed bearing used if the slurry is corrosive or abrasive.

this Rotary Drum Pressure Filter is Typical

of the special designs G-B engineers develop to handle particular needs. The filter drum is 6'-0" in diameter by 8'-0" in length, and in this instance maintains a positive pressure of carbon dioxide on the filter cake to prevent the chemical reaction from reversing. Every detail has been worked out to fit the filter to the exact needs, rather than utilizing a "standard" filter and making the process conform to the filter.

Process-minded G-B Engineers will work with you, too... without obligation!

GOSLIN-BIRMINGHAM
MANUFACTURING CO., INC.
BIRMINGHAM • ALABAMA

ACTIVATED CHARCOAL PROCESSOR INCREASES YIELD FROM 53% TO 76%

ALLIS-CHALMERS ROLLER MILL



Single Pass Multiple Stage Milling Paid for Itself First Year!

By replacing a hammermill yielding 53% of usable product with a modern Allis-Chalmers two pair high roller mill, a charcoal processor increased his minus 10, plus 28-mesh screen yield to 76%.

Because of the increase in yield, this mill, operating with an Allis-Chalmers gyratory screen, *paid for itself in less than a year!*

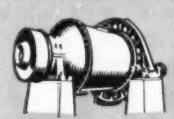
This big increase was made possible by the *gentle* size reduction afforded by roller mill grinding. There is no excessive shattering and no size destroying impact. And, multiple stage grinding in roller mills minimizes fines.

To meet your varying requirements in chemical processing, Allis-Chalmers roller mills are built in one, two and three pair high models. Double and triple roller mills are used when no separation is necessary between reductions. Roll lengths range from 18 to 42 inches in 9 and 10-inch diameters.

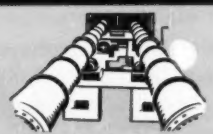
For complete information on roller mills and other equipment for your industry, call your A-C representative or write Allis-Chalmers, Milwaukee 1, Wis.

A-4596

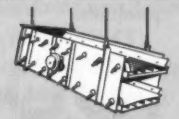
Other Processing Equipment for the Chemical Industry



Grinding Mills



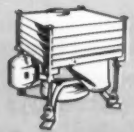
Kilns, Dryers, Coolers



Vibrating Screens



Compacting Mills



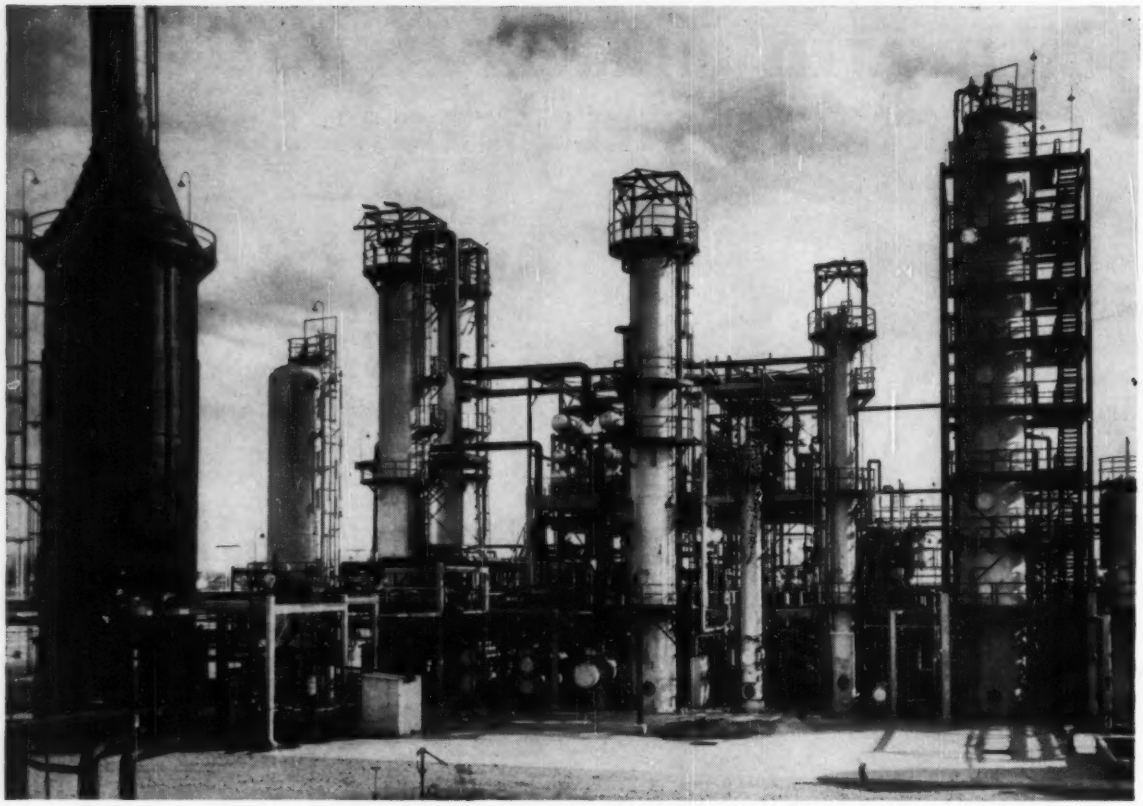
Gyratory Screens



Man-Lifts

ALLIS-CHALMERS

A-C ALLIS-CHALMERS



Solvent Refining of Middle Distillates by . . .

Azeotropic Distillation

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Furfural is widely known as an excellent solvent and extracting agent—it's safe to handle, cheap, readily available. But it has one bad characteristic: it boils very close to the boiling range of a class of petroleum stocks called "middle distillates." Separation by a simple distillation is impossible.

From these middle distillates come our supplies of heating oils, jet fuels, diesel fuels and feed to catalytic cracking units. The petroleum industry has had to go to the processing of crude oils with high percentages of sulfur to meet the increasing demand for these fuels. But this sulfur must be removed from the middle boiling range stocks—it raises havoc with ignition, combustion or catalyst.

The Texas Co. has solved this problem by the development of an economical process for furfural extraction and furfural recovery in the treating of middle distillates.

▶ **How Does It Work?**—At the Eagle Point Works in Westville, N. J., furfural is separated from extracted oil by azeotropic distillation, where furfural comes off as a ternary azeotrope—water-furfural-oil.

This ternary has the unusual characteristic of separating on cooling into three phases—oil-rich, water-rich and furfural-rich. This makes a low cost operation possible, because parts of the separation can be accomplished in settlers requiring no consumption of costly energy.

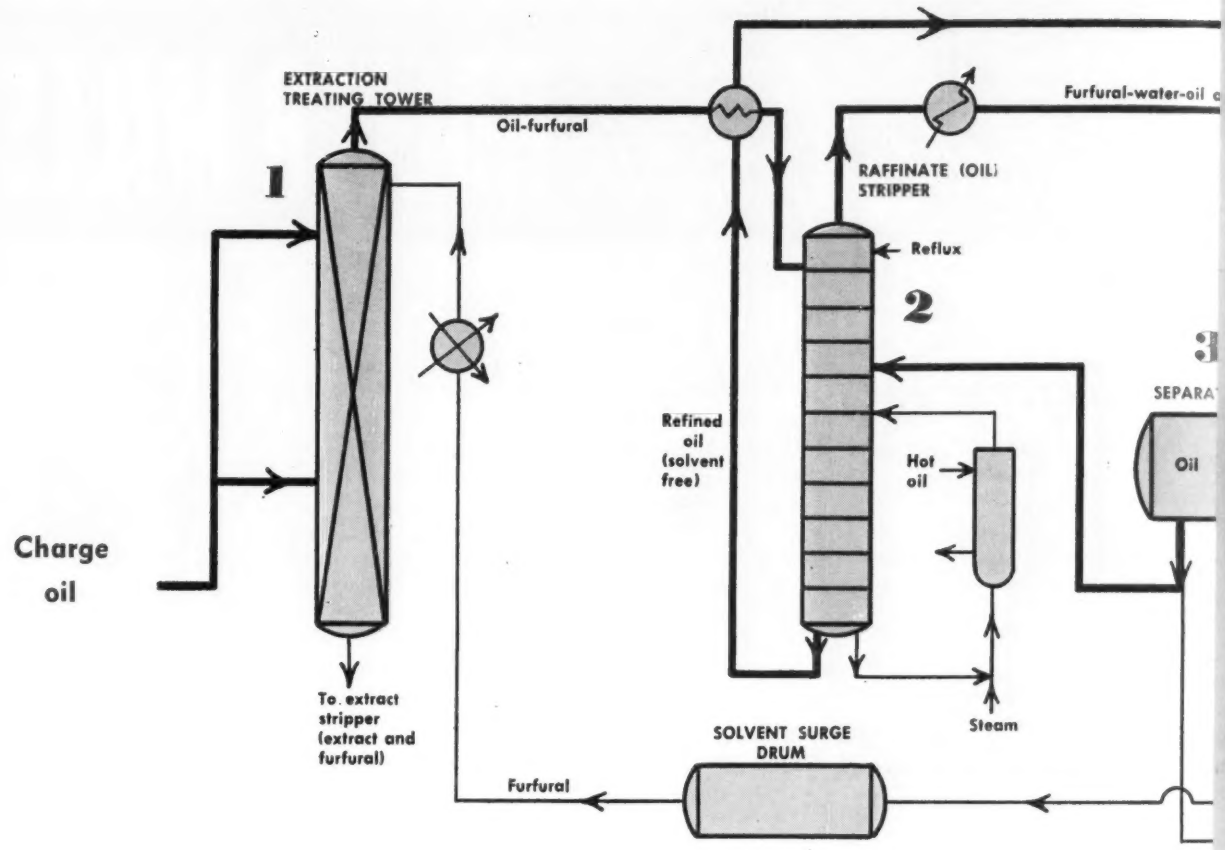
In the solvent from raffinate recovery system, the refined oil—containing as much as 5% furfural—is purified by adding sufficient steam to form a ternary composition overhead, which includes all the furfural present. The overhead azeotrope leaves a solvent-free raffinate as discharge from the column.

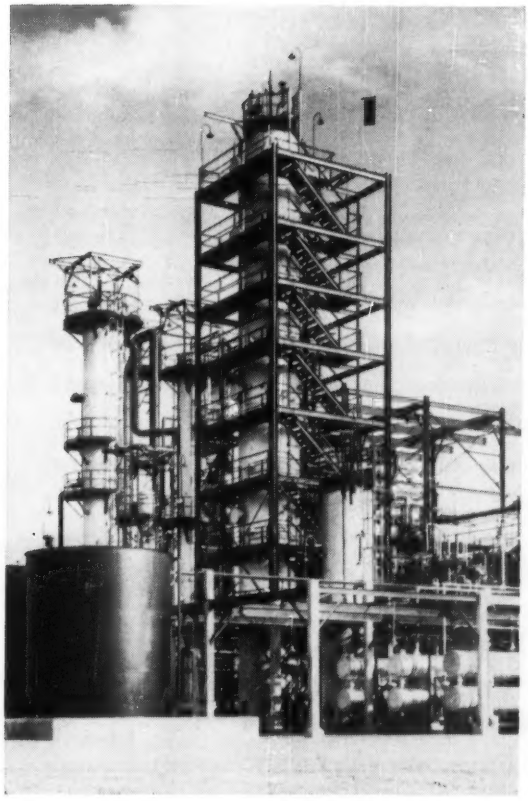
▶ **More Recovery**—Recovery of furfural from the material extracted is handled in a similar manner. Actually the extract contains sulfur compounds, nitrogen compounds, metals and aromatics. The extract solution is charged to a distillation tower with sufficient water to form a ternary or binary azeotrope. This includes all furfural, leaving a solvent-free extract as the bottoms product.

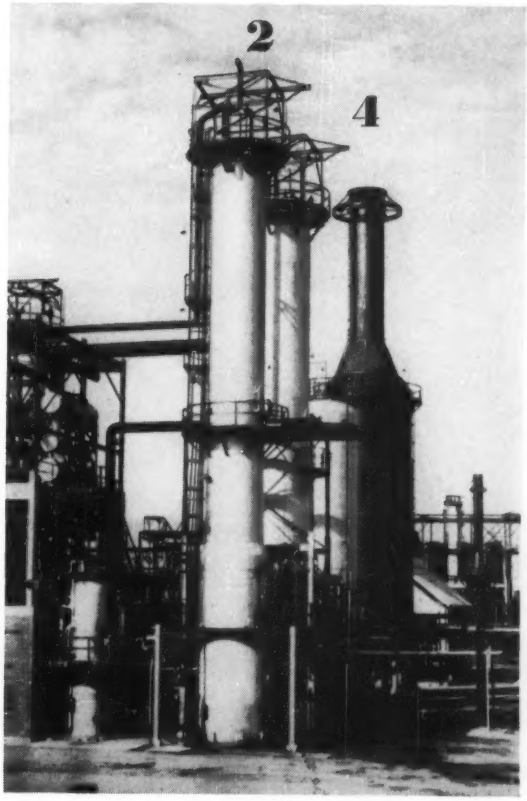
These ternary—or binary—azeotropes distilled overhead separate on cooling into either three or two phases. They are sent to the separator, where the phase separation takes place.

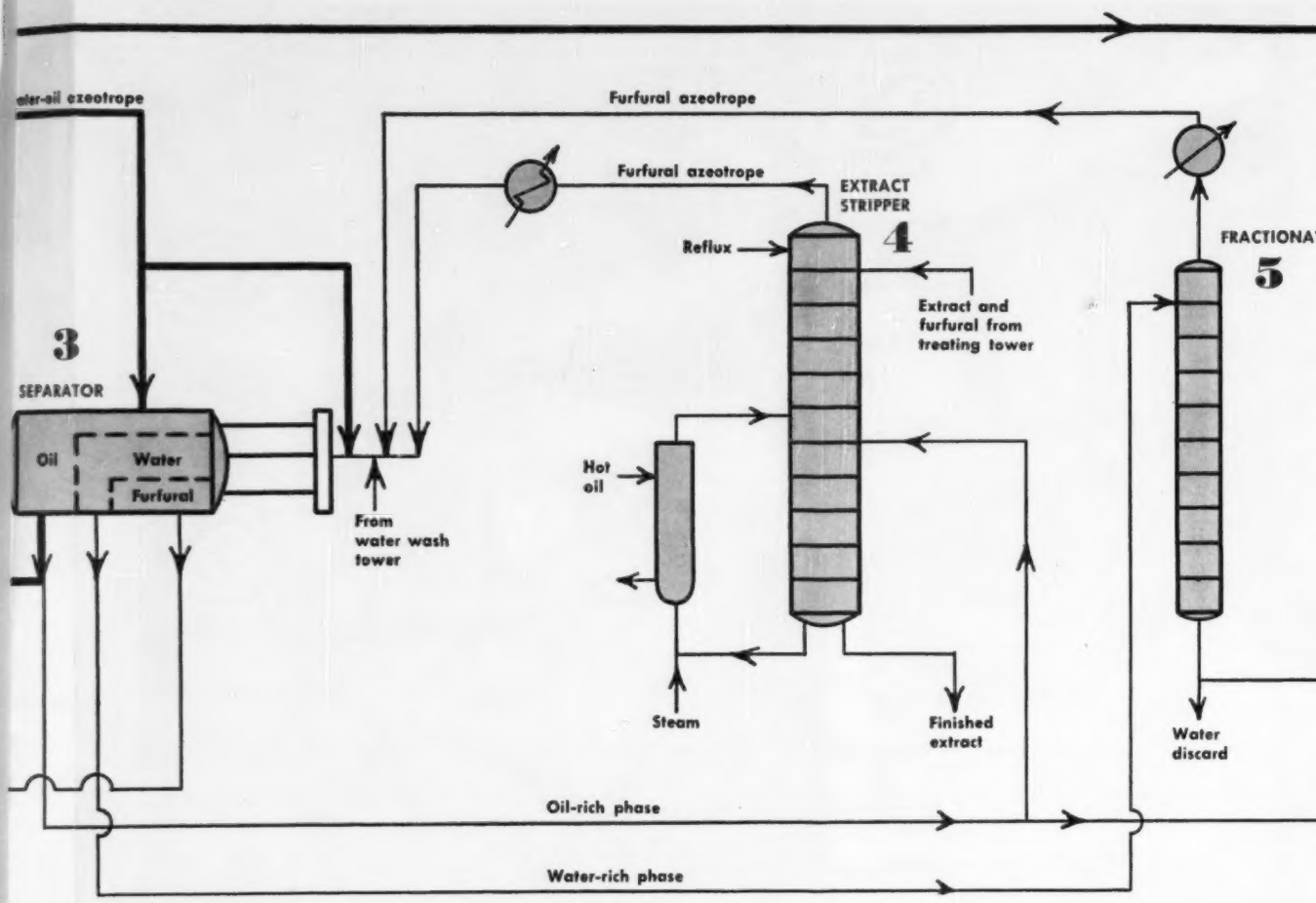
Another point for solvent recovery is in the separated water. This is handled in a recovery column, also dependent on the formation of an azeotrope. Overhead is sent to the separator.

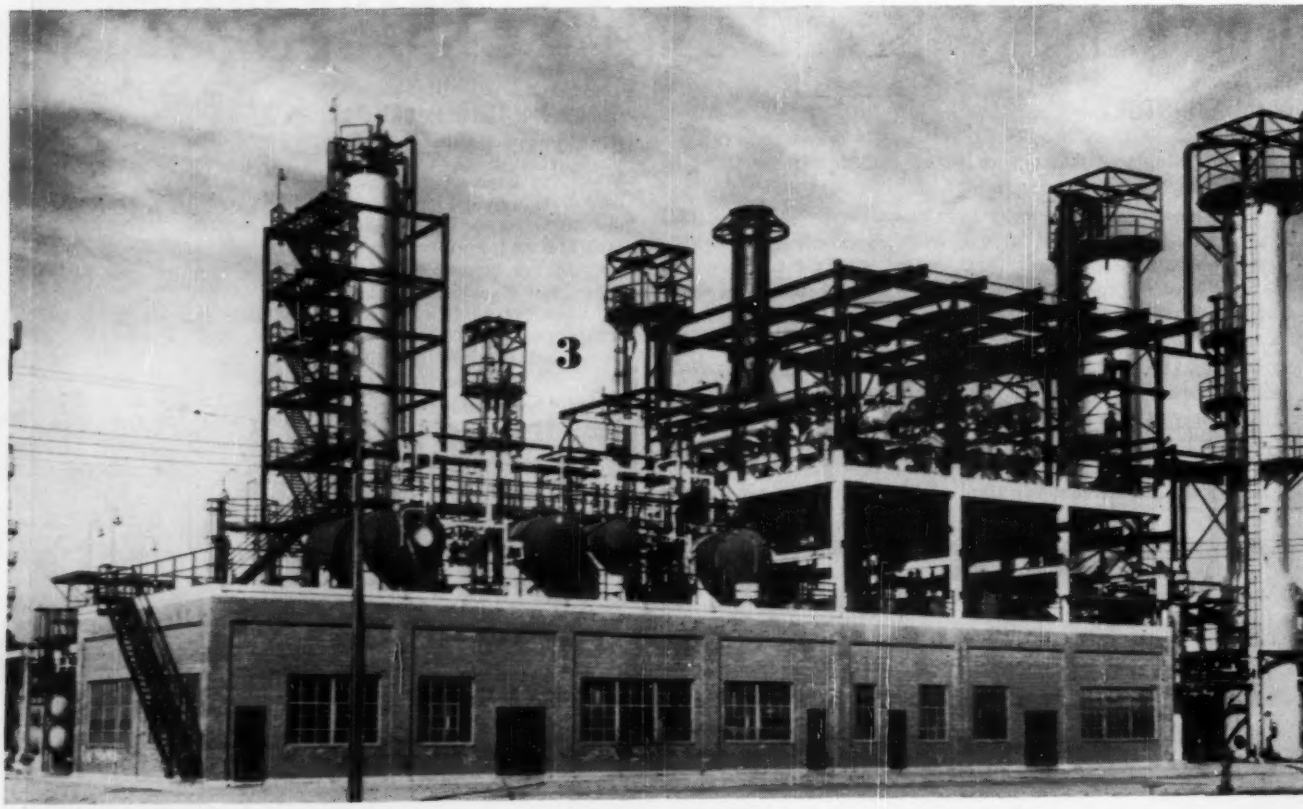
A water wash tower is included in the process for the removal of furfural from low boiling oil fractions.

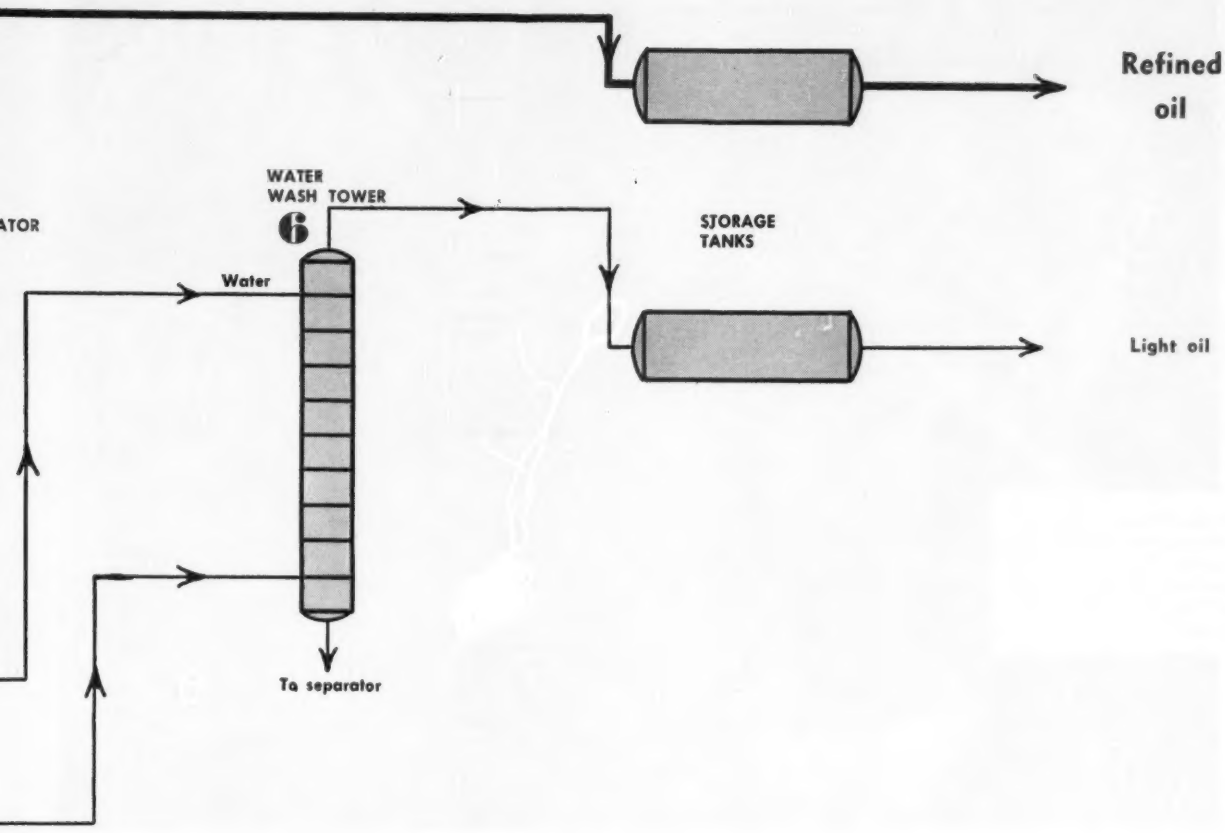

EXTRACTION
TREATING TOWER
Oil-furfural
Furfural-water-oil
RAFFINATE (OIL)
STRIPPER
Reflux
1
2
3
SEPARA
Refined
oil
(solvent
free)
Hot
oil
Oil
Charge
oil
To extract
stripper
(extract and
furfural)
Steam
SOLVENT SURGE
DRUM
Furfural

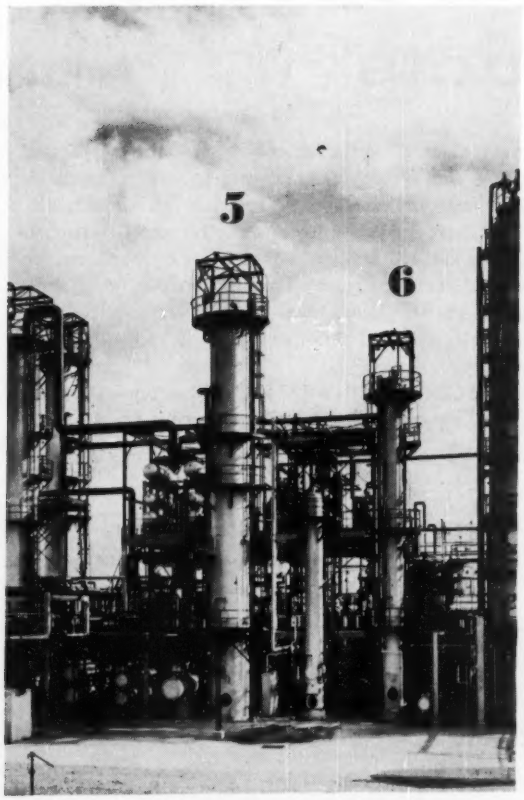

1


2
4


ater-oil azeotrope
Furfural azeotrope
Furfural azeotrope
EXTRACT
STRIPPER
4
Reflux
FRACTIONA
5
Extract and
furfural from
treating tower
3
SEPARATOR
Oil
Water
Furfural
From
water wash
tower
Hot
oil
Steam
Finished
extract
Water
discard
Oil-rich phase
Water-rich phase


3





Key Process Components

- Extraction system, where furfural removes sulfur compounds from middle distillate oils. (See 1)
- Furfural-from-raffinate recovery system, which includes steam stripping and azeotrope formation. (See 2)
- Furfural-from-extract system for recovery of furfural. This includes azeotrope formation. (See 4)
- Furfural-from-water system for recovery of furfural, and elimination of water. (See 5)
- Water-wash system, for removal of furfural from low boiling oil fractions. (See 6)



This Tolhurst Centrifugal with "all-speed" drive is used to determine best centrifuging speeds for photographic and fine chemicals. Photo courtesy of Ringwood Chemical Company, Ringwood, Illinois.

How to find the best centrifugal speeds for your products

Determining the most efficient centrifuging speeds can help you lower manufacturing costs and increase production. For only the *right* speeds will make the proper degree of separation in the shortest time.

Tolhurst's "all-speed" hydraulic drive helps you establish the best basket speeds for loading, extracting, washing and unloading. You can select *any* speed from 0 to maximum RPM. Your tests show you which speed performs each operation most efficiently.

Or, do you have the problem of processing many different materials that have dissimilar filtering and washing characteristics? With "all-speed" drive, you can process them all in the same Tolhurst Centrifugal.

You simply turn a handwheel to change speed. A tachometer indicates basket speed at all times. "All-speed" drive is now available on any Tolhurst Centrifugal. Baskets are 12″ up to 108″ in diameter and can be perforate or imperforate. Construction can be of steel, steel rubber covered, monel or other corrosion-resistant materials. For full information, write for illustrated catalogs.

FREE CENTRIFUGING CALCULATOR—A new slide rule for quickly calculating centrifugal force is yours for the asking.

Tolhurst CENTRIFUGALS

A DIVISION OF

American Machine and Metals, Inc.

DEPT. CE355, EAST MOLINE, ILLINOIS

☐ Send new free centrifugal force calculator

☐ Send catalog ☐ Have representative call

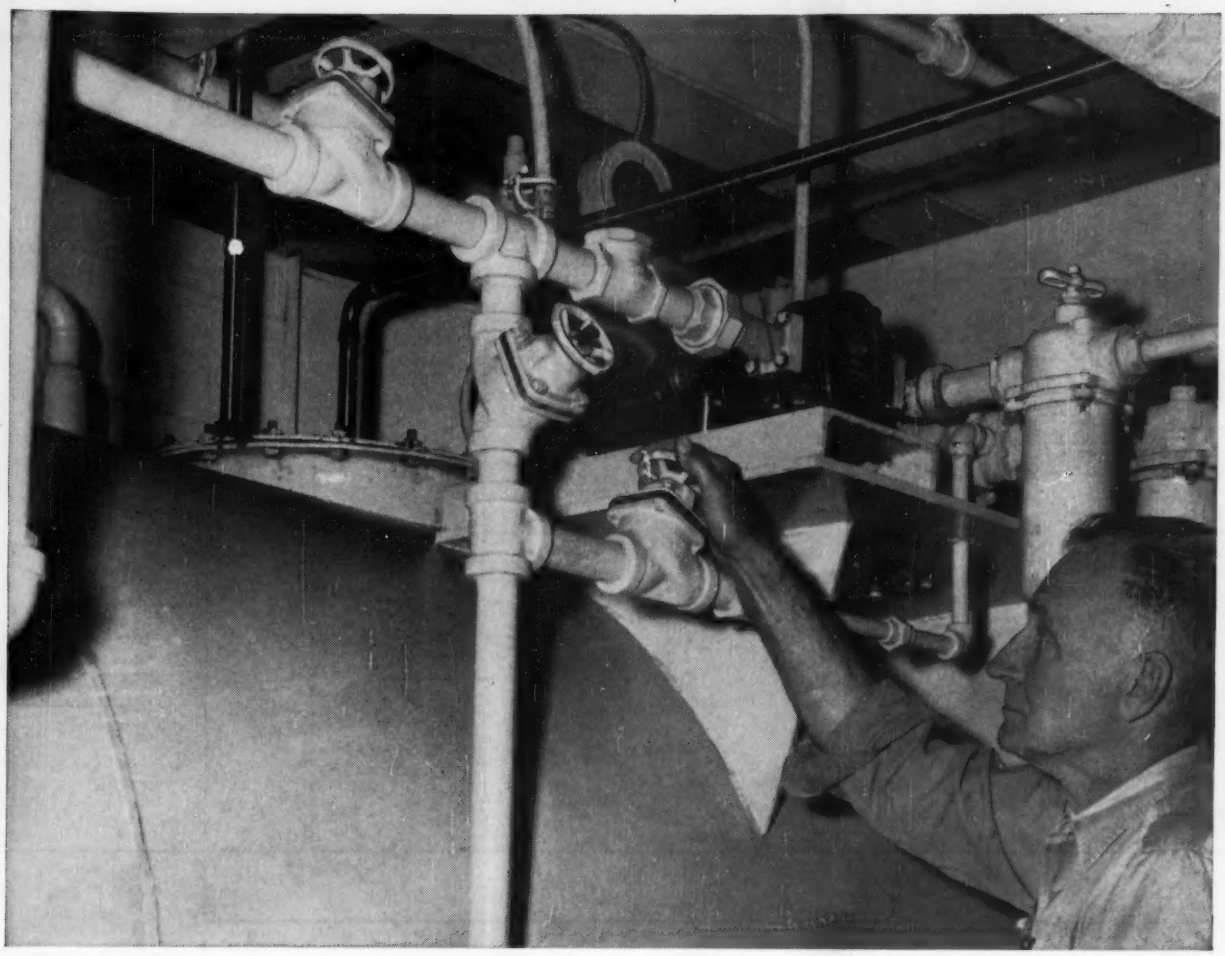
Name and title_____

Company_____

Address_____

City_____ Zone____ State_____

Specialists in Liquid-Solids Separation



Light oil meets its master in these CRANE VALVES

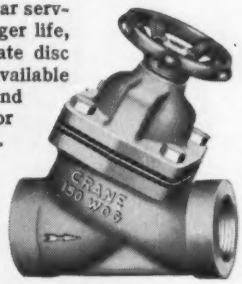
THE CASE HISTORY— Read how the Johnson & Johnson baby products plant at Cranford, N.J., completely stopped a valve leakage condition that wasted product . . . caused a safety hazard . . . and menaced the plant's high sanitation standards.

Valves formerly used on very light baby oil lines were the source of trouble. Keeping them tight at the stuffing box was next to impossible. Constant servicing of stuffing boxes was necessary, even after repacking every 4 to 8 weeks. Several packings were tried without success while the high maintenance costs and nuisance conditions continued.

Early in 1951 the plant found the solution in Crane No. 1610 Packless Diaphragm Valves. They removed the cause of leakage —immediately stopped its troubles and costs. Almost 4 years later—with no maintenance whatsoever—the Crane packless valves remain absolutely tight; continue giving perfect service. And that goes for all valves added since the first installation.

Crane No. 1610 Packless Diaphragm Valves

When you have valve problems with hard-to-hold fluids, try Crane *Packless* diaphragm valves. They eliminate stem leakage and maintenance on air, vacuum, gas, light oil and similar services. Their diaphragm has longer life, yet should it fail, their separate disc prevents escape of line fluid. Available in wide selection of materials and sizes. Ask for folder AD-1942 or see your Crane Representative.





CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955

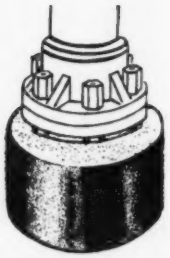
a Great Name in ROLLER MILLS

Raymond is a name closely identified with the manufacture and development of Roller Mills for the past sixty years.

Today's version of the standard High Side Roller Mill is a composite of many advanced features that provide flexibility in control, ease of adjustment, uniformity in production and economy of operation.

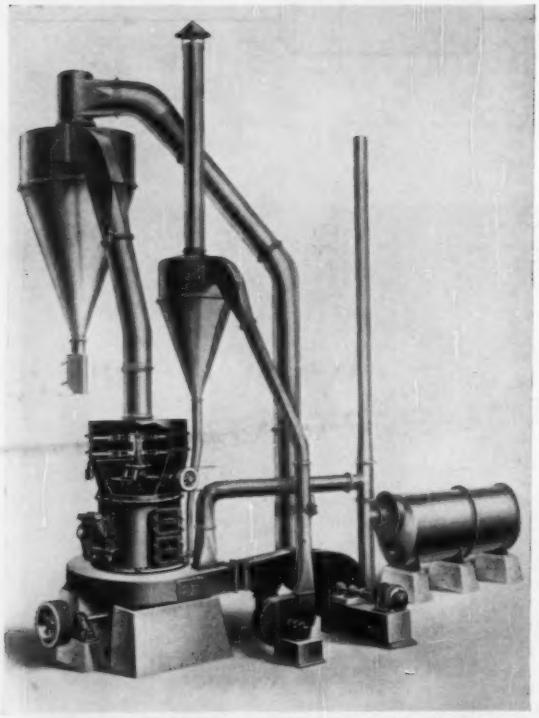
(1) Pneumatic feed control increases efficiency by maintaining a maximum "load" on the mill under all conditions. (2) Special lubrication system and high grade bearings result in record low operating and maintenance costs. (3) Sturdy construction and finely engineered design insure long life of the equipment, and help to reduce wear on mill parts and lower power consumption.

For grinding chemicals, pigments and a great variety of non-metallics and manufactured products, Raymond Roller Mills offer you an economy-proved method of production.



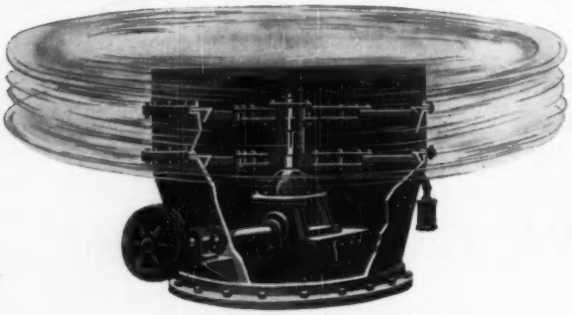
RAYMOND OIL JOURNAL
assures positive self-lubrication of roller elements, and reduces overall maintenance.

HIGH SIDE ROLLER MILL



WITH FLASH DRYING SYSTEM
For removing surface moisture from the material in the pulverizing operation.

WHIZZER SEPARATION
An Exclusive Feature of Raymond Mills



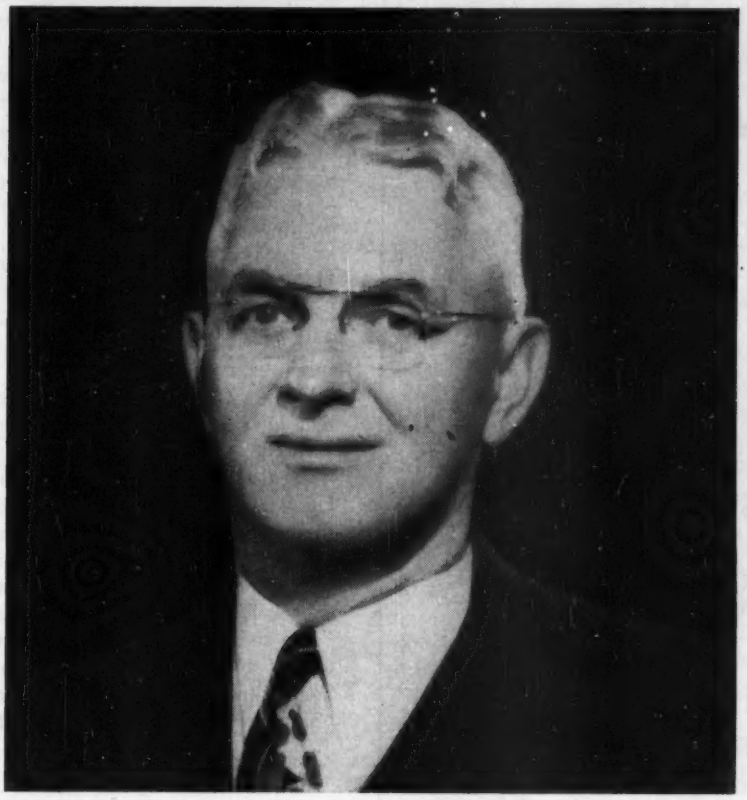
The patented Whizzer is built as an integral part of the Raymond Mill Air Separator. It is driven by an independent motor through a variable speed transmission. One simple adjustment controls the fineness over a wide range. Very efficient for making a high-grade, uniform product.

Write for Raymond Catalog No. 72 for further details

COMBUSTION ENGINEERING, INC.
Raymond Division

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Chicago 22, Illinois

Sales Offices in Principal Cities



William I. Burt: Man of the Month

Well known vice president of Goodrich Chemical is named president of Goodrich-Gulf Chemicals, Inc.

One of the sidelights of the government's rubber plants disposal program was a realignment in the top management of one of the bidding companies. After buying a plant the emphasis shifts from financing considerations to production, and Goodrich-Gulf Chemicals has prepared for this shift by naming a production man, William I. Burt, as its president.

Bill Burt comes to the presidency from a succession of posts in which he has directed production and trained other men for production responsibilities. In addition to heading Goodrich-Gulf, he will continue serving as a vice president of B. F. Goodrich Chemical Co.

▶ **Job Ahead**—Goodrich-Gulf Chemicals, half-owned by the B. F. Goodrich Co. and half by Gulf Oil Corp., has bid successfully on two of the government's plants. One is a 90,000-ton copolymer plant. The other is a 197,000-ton butadiene plant, more than three times as big as any other, in which Goodrich-Gulf has a half interest with Texas-U. S. Chemical Co. Both plants are in Port Neches, Tex.

Bill Burt's new job will involve operating these plants to turn out synthetic rubber of a type used in automobile tires and other principal rubber products.

▶ **Wide Experience**—Production experience, Burt feels, is beneficial to men training for any role in chemical company operation. Many of the present key men, and nearly all of the top production men in Goodrich Chemical, came from the company's plant No. 3, which Burt headed for 15 yrs.

In addition to production training, Burt himself garnered experience in many other phases of chemical company business. After receiving his BS in chemical engineering from Ohio State University, he worked as a chemist for several companies and for the Chemical Warfare Service in World War I.

He followed this with a stint as sales engineer for the Bristol Co. And later he became a chemical engineer for Dolomite Products and then for Republic Steel.

▶ **Joined Goodrich as Chemist**—In 1927, Burt joined B. F. Goodrich in Akron, Ohio, as a research chemist. In a short time he was named manager of the company's chemical manufacturing division.

He was elevated to superintendent of production of the growing chemical division in 1942. And, the following year, he became general manager of plants.

In 1945, when B. F. Goodrich Chemical Co. was formed from the chemical division, Burt was named vice president in charge of manufacturing for the new company.

▶ **Seeing and Doing**—In these posts, Burt has been able to do some traveling. Highlights include trips to England, Japan and Brazil to help form companies to produce Goodrich's Geon—polyvinyl chloride.

Perhaps Burt's greatest achievement was the part he played in building the American Synthetic Rubber Industry from practically nothing into a key factor in the winning of World War II.

In the early days of the war, Burt was appointed to a vital post in the project, chairman of the standard plant design committee. Under his guidance, this committee took nebulous laboratory and pilot plant data and evolved the basic

FIRE!



Unless you get the jump on fire the minute it starts, you stand a good chance of kissing your business good-bye.

That's why it's so important to have a Kidde portable extinguisher near *every* fire hazard in your plant.

Protect motors, electrical equipment, flammable liquids and machinery with Kidde portables. Then, when fire strikes, you're ready for it.

Just grab a Kidde CO_2 or dry chemical portable, aim the horn, pull the trigger, and—Whoosh! No more fire!

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328 Main Street, Belleville 9, N.J.

Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

NAMES . . .

design on the rubber plants in a matter of months. And in a year and a half, many of these plants were in successful operation.

This achievement was recognized in 1943 when CHEMICAL ENGINEERING presented its biennial award to the industry for what was termed "a miracle of chemical engineering construction and planning."

Over the years Burt has also been active in the AIChE. For six years he served as director, and in 1952 he was elected president of the Institute.

▶ **Home Carpenter**—Burt claims that his favorite hobby is relaxing at home. And amateur carpentry is his favorite form of relaxation. He has an elaborate home workshop and friends term him a "craftsman deluxe." Products of his wizardry fill the Burt home in Cleveland's Shaker Heights suburb.

He and his wife both enjoy gardening and hope to retire to the South one day and pursue this hobby on a year-round basis.—HTS

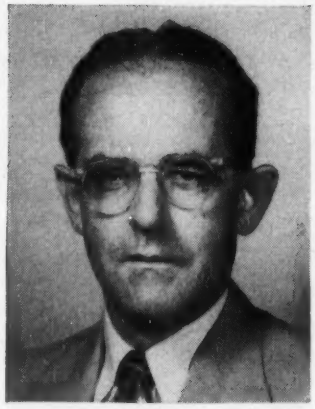
Karl Winnacker—Elected president of DECHEMA (Deutsche Gesellschaft fuer Chemische Apparatewesen), organization sponsoring ACHEMA XI and the Congress of the European Federation for Chemical Engineering in Frankfurt-am-Main, May 14-22. Dr. Winnacker is chairman of the board, Farbwerke Hoechst, A. G.

Gus Ostenson—Resident manager of Crown Zellerbach Corp.'s new Antioch, Calif. factory.

B. R. Colkett—Vice president of Fibreboard Products, Inc., San Francisco, Calif.

Lawrence R. Hafstad – Granted AEC's Distinguished Service Award. Dr. Hafstad was formerly director of the AEC's division of reactor development.

R. H. Lueck – Vice president in charge of American Can Co.'s research and technical department.



Max Key

Mr. Key has been promoted to manager of Dow Chemical Co.'s plastics production department. Since joining Dow in 1928, he has been associated with the production of ethylene dichloride, Ciba dyes, acetanilid and the development and production of saran polymers. In addition to his duties with the parent company, Mr. Key is a director and vice president of Asahi-Dow Ltd., a Dow Chemical International associated company manufacturing saran materials in Japan.

S. D. Payzer—Vice president in charge of engineering for the D. J. Murray Manufacturing Co., Wausau, Wis.

R. S. Holmes—Manager of the research and development department, arms and ammunition division, Olin Mathieson Chemical Corp.

Paul L. Welsh—Production manager of Owens-Corning Fiberglas Corp.'s Newark, Ohio plant. **Robert M. Daiss** succeeds Mr. Welsh as manager of the firm's Santa Clara, Calif. plant.

Preston A. Wells—Manager of engineering in the chemicals department of The Quaker Oats Co., Chicago, Ill.

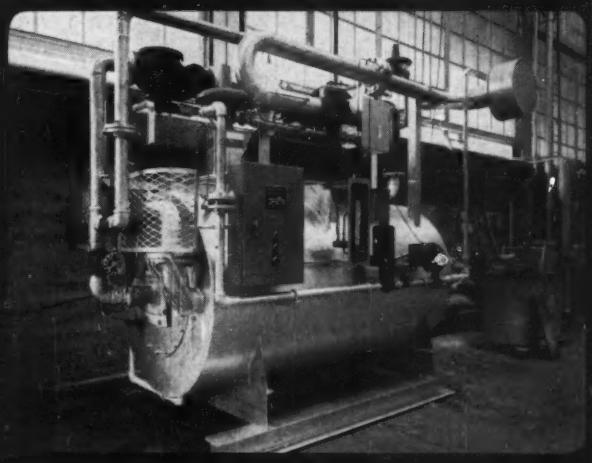
Ralph C. Kimball—President of the Philadelphia section, Instrument Society of America. Mr. Kimball is division engineer in charge

"We Should Have Had This Years Ago," Said a U.S. Industrial Chemicals' Executive of a Gas Atmospheres' CO_2 Generator

Many chemical plants have a by-product supply of carbon dioxide gas which they often attempt to salvage and harness for blanketing and purging use within their own plant. However, relying on such a source is risky at best. It is dependent upon regular production of the product from which the gas is derived and subject to uncontrolled variances of gas purity and compression.

The Gas Atmospheres' compact, high efficiency, self-contained gas generators, that will produce any amount of atmosphere directly from city gas or oil, in the pressure and purity desired, best relieves this undesirable dependency. Wherever users of carbon dioxide, nitrogen or inert gas have heard the story, compared prices and weighed the advantages of this independent gas supply against any other source, Gas Atmospheres has been able to do business.

For example, after comparing costs and production figures, one executive of the U. S. Industrial Chemicals plant in New Orleans said of their new Gas Atmospheres' generator, "We should have had this years ago." Perhaps you should have, too. Why not find out? Just drop a line to Gas Atmospheres, Inc., and let us know the gas consumption you require and we'll work out a cost chart that will show you how this amazing generator will pay for itself in a few months.



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"With our
Abbe Dispersall Mixer
we have reduced our
labor cost and get
a much finer paste"

We are using our Abbe Dispersall Mixer in the manufacture of heavy pastes, and find that we have reduced our labor cost and get a faster mix by using this piece of equipment over the old type of equipment which we were using. In the old mixers we could mix only 300 lbs. at a batch, whereas with the Abbe Mixer we can mix 900 lbs. at a batch.

We purchased this piece of equipment complete with vacuum pump, and we find that we get a very much finer paste due to the fact that mixing under vacuum, we do not mix in a lot of air bubbles.

Yours very truly,

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Abbé Dispersall Mixer in the manufacture of heavy pastes mentioned above.

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NAMES . . .

of instrumentation in American Viscose Corp.'s engineering department.

Sidley O. Evans—Manager of tubing operations at Babcock & Wilcox's tubular products division plant in Beaver Falls, Pa.



Thomas P. Simpson

Mr. Simpson has been elected vice president and director of manufacturing of the General Petroleum Corp. He joined the company in 1924, then was transferred to its western affiliate, Socony-Vacuum Oil Co., Inc., in 1935. After 18 years at Socony—during which he served first, as chief development engineer, later, as director of the research and development department—Mr. Simpson rejoined General Petroleum in 1953.

E. R. Stevens—Executive vice president of the Baldwin-Hill Co., Trenton, N. J.

H. E. Barrentine, Sr.—Construction management engineer with Baltimore Contractors, Inc. Mr. Barrentine was formerly associated with the chemical plants division of the Blaw Knox Co.

Linwood A. Walters—Development manager of the Durite department of the Borden Co.'s chemical division.

F. B. Bowen—Appointed to the newly-created position of production manager of International Minerals & Chemical Corp.'s phosphate minerals division.



Thomas P. Brown

Mr. Brown, formerly technical vice president of Reichhold Chemicals, Inc., has been appointed to the vice presidency of Scientific Design Co., Inc., New York. In his new capacity, Mr. Brown will be in charge of new project development for the company.

Armand F. DuFresne–Named to the newly-created post of chief product engineer for Consolidated Engineering Corp., Pasadena, Calif.

Archie Black–Head of the research and development division of Douglas Laboratories Corp., Miami, Fla.

William H. Schuette–Assistant to the general manager of the Midland division, Dow Chemical Co.

Herbert B. Clark – Executive vice president of Fansteel Metallurgical Corp. and its subsidiaries.

Rolf Bernegger–Named manager of the Geigy Chemical Corp. plant at Cranston, R. I. Dr. Bernegger will continue to act as head of the plant's production department.

K. O. William Sandberg – Appointed manager-engineering of General Electric Co.'s plastics department.

Wilbur E. Bindenagel–Vice president of the Glidden Co., in charge of the company's trading

Performing Seal!

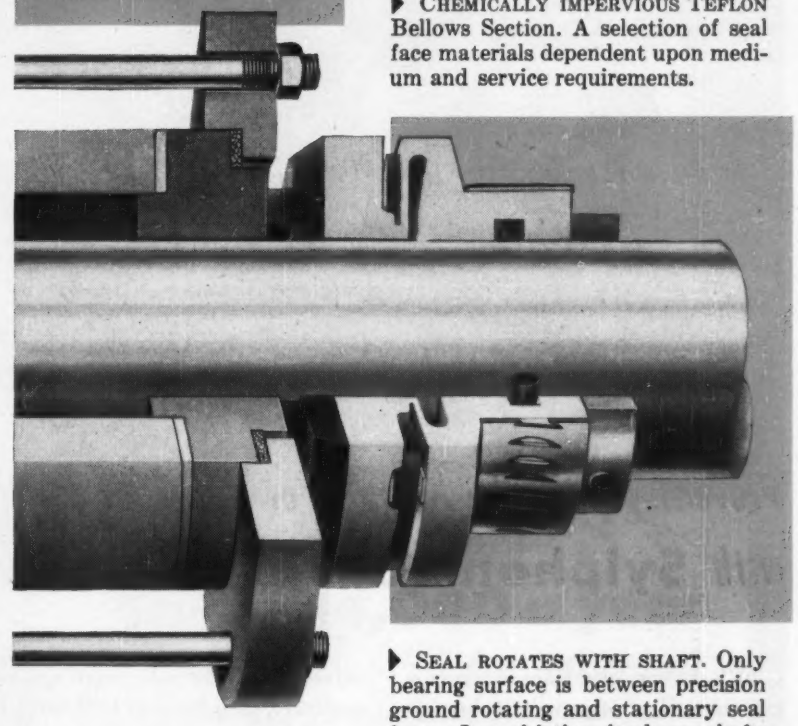
Service that no other Mechanical Seal can match

Pump difficult chemicals...with drop-tight service over longer periods of time. That is what Chemiseal's chemically impervious TEFLON, pressure-balanced bellows design offers you.

The ideal Mechanical Seal that has no equal in handling acids, alkalies, solvents, hydrocarbons, alcohols—clear liquids, slurries and tarry materials.

FEATURES

▶ CHEMICALLY IMPERVIOUS TEFLON Bellows Section. A selection of seal face materials dependent upon medium and service requirements.



▶ SEAL ROTATES WITH SHAFT. Only bearing surface is between precision ground rotating and stationary seal faces. Low friction load on shaft. Lower power cost. Drop tight service.

▶ NO SCORING OF SHAFTS and Chemiseals work satisfactorily on shafts previously scored by other seals or packing.

▶ PRESSURES at the seal up to 100 psi at 75°C or 75 psi at 100°C.

▶ SIZES from ⅛" to 2½". Other sizes for special applications.

▶ MAXIMUM LENGTH, all seals 2¾".

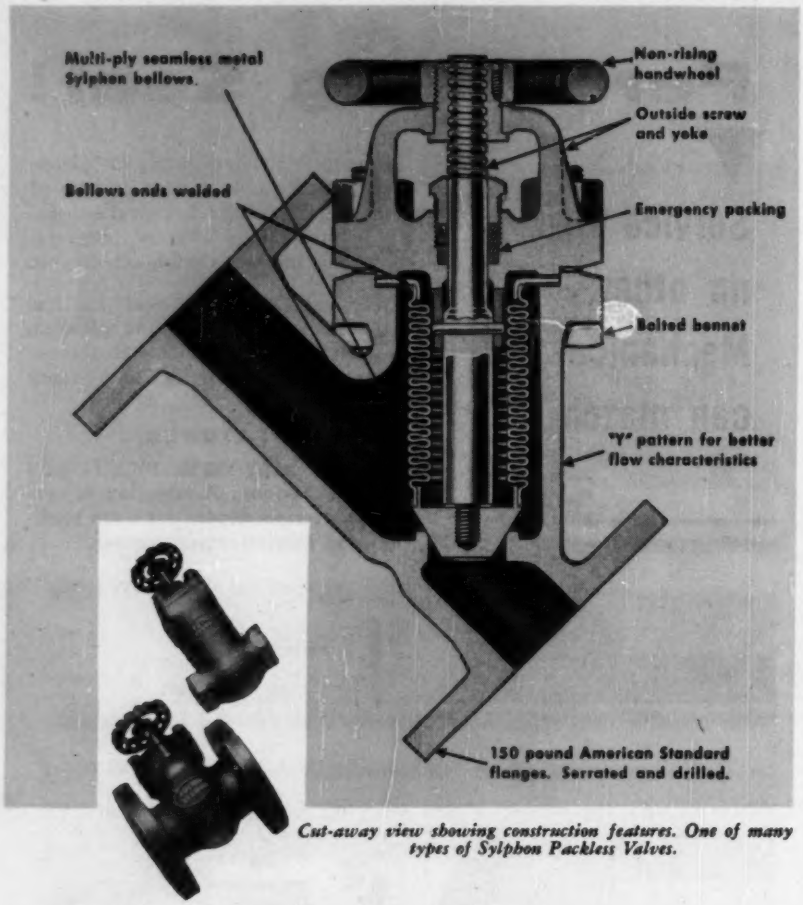
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USG FABRICATORS OF FLUOROCARBONS & OTHER PLASTICS

Representatives in principal cities throughout the world



Cut-away view showing construction features. One of many types of Sylphon Packless Valves.

Prevent pipeline leakage in or out—for sure! *with* Sylphon Packless Valves

Wherever pipelines carrying gasoline, oil, or other volatile liquids and vapors must have positive protection against leakage, install Sylphon Packless Valves and forget leakage for good!

There's no packing to leak or replace, because a rugged, seamless Sylphon metal bellows replaces customary packing. The bellows eliminates leaks that might seep past the stuffing box of the best packed type valve. It seals the valve stem against corrosive, dangerous or inflammable liquids or gases. And here's a plus advantage—Sylphon Packless Valves also provide vacuum protection.

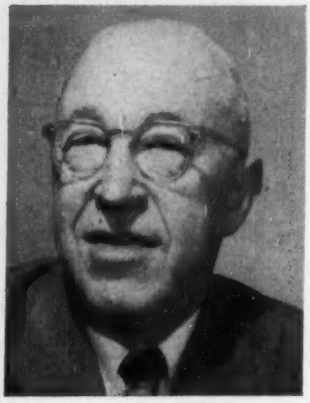
Many sizes and types made of brass, monel, stainless steel, etc. A few are pictured here. Widely used in chemical plants, oil refineries, power plants, aboard ships. Ideal as standard equipment. For complete information, write today. Ask for Bulletin EC-813

Robertshaw-Fulton CONTROLS COMPANY

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NAMES . . .

operations. In addition to his new duties, Mr. Bindenagel will continue as assistant general manager of the company's chemurgy division.



F. J. Bartholomew

After 35 years with Chemical Construction Corp. (one of the longest terms of service in the company's history), Mr. Bartholomew retired at the beginning of the year. Referred to as "Mr. Sulfuric Acid" by his friends in the chemical industry, Mr. Bartholomew is the inventor of the hot coke sludge conversion process for the recovery of waste sulfuric acid. He also invented other chemical processes and compiled the Chemico acid handbook.

R. Allyn Budington, Jr. – Elected treasurer of Rayonier Inc. Mr. Budington replaces **Lawrence G. Wilson**, who died in December.

Edward Tarnell–Vice president of Roger Williams Technical and Economic Services, formerly market research director.

Arthur B. Bakalar–Director of Shell Development Co.'s patent division, succeeding **Bernard J. Gratama**, who retired.

Gordon K. Teal – Appointed to head the research division of Texas Instruments Inc.

J. W. Miller–Executive vice president and director of Brea Chemicals, Inc., a subsidiary of Union Oil Co. of Calif.

Lucas P. Kyrides—Staff consultant in organic chemistry to the research and development division, Wyandotte Chemicals Corp. Dr. Kyrides was formerly president and director of research of Sumner Chemical Co.

OBITUARIES

Harry C. Hackett, staff sales manager and assistant secretary of National Vulcanized Fibre Co., died December 6 after a prolonged illness.

Robert H. Owens, 52, superintendent of Tin Processing Corp.'s waste acid plant, Texas City, Tex., died December 11.

James E. Skane, 63, engineer and executive of the Manhattan Rubber Division, Raybestos-Manhattan, Inc., died on December 15 after a prolonged illness. During World War II he served in the office of the rubber director, Department of Commerce.

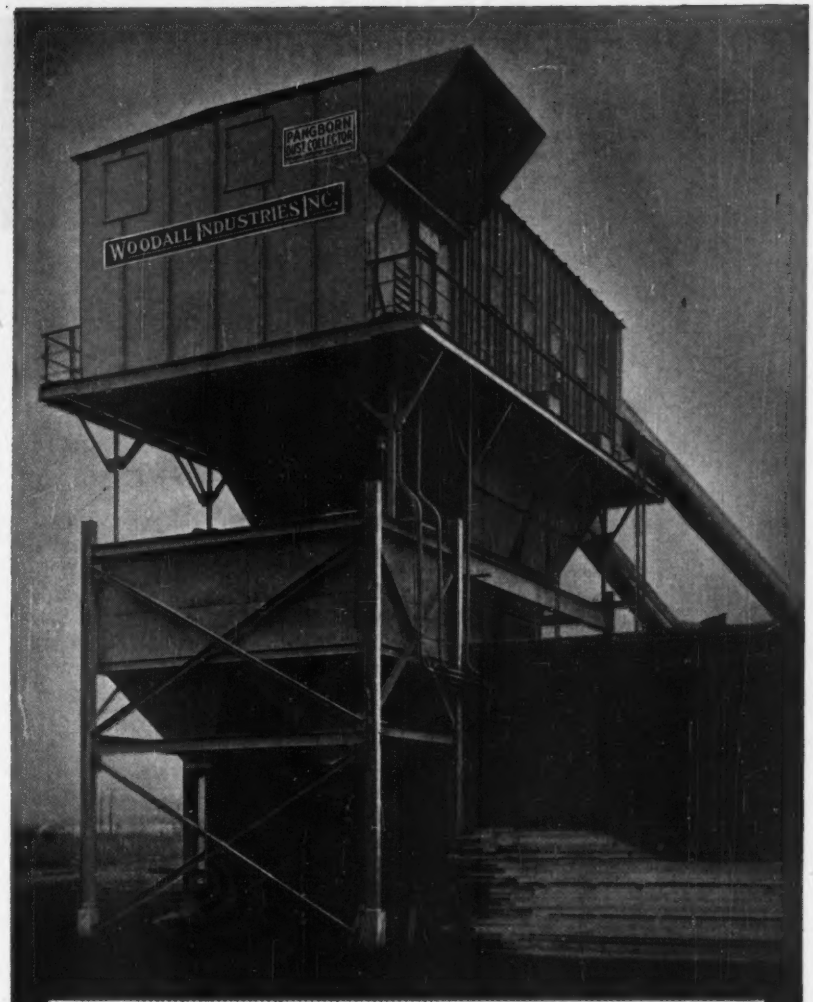
John A. Britton, Jr., former president and director of Enjay Co., Inc., an affiliate of Standard Oil Co. (N. J.), died in his sleep on December 16.

Lawrence G. Wilson, treasurer of Rayonier, Inc., died in his New York home on December 16. Mr. Wilson was 64 years old.

Herbert B. Sliger, associated with Commercial Solvents Corp. for more than 26 years, died in New Rochelle, N. Y., on December 19.

William M. Burton, 89, retired president of Standard Oil Co. (Ind.), died December 29 at Miami, Fla.

Max Jakob, authority on heat transfer and a research professor in the mechanical engineering department of Illinois Institute of Technology, died of a heart attack on January 4. Dr. Jakob was co-author of an eight-volume work, "The Chemical Engineer," published in 1935.



Pangborn Dust Control

Saves $14,000 a year for Woodall

The Long Island plant of Woodall Industries, Inc., had a serious problem. Fabricating Masonite for its hundreds of products released so much dust that, without efficient dust control, work would be practically impossible. So Woodall installed a Pangborn Dust Control system.

The result? The dust collected not only leaves the plant dust-free but provides *all* the fuel for heating and processing requirements. Savings on fuel bills amount to $14,000 a year! Pangborn Dust Control at Woodall pays its own way *with a profit* for the firm.

Pangborn can solve *your* dust problem. Pangborn engineers will be glad to show you how Pangborn Wet or Dry Dust Collectors can save you time, trouble and money!

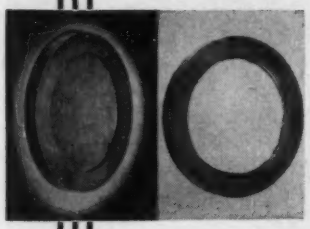


See how Pangborn benefits varied industries. Write for free copy of "Out of the Realm of Dust." Pangborn Corp., 2600 Pangborn Blvd., Hagerstown, Maryland.

Pangborn
CONTROLS DUST

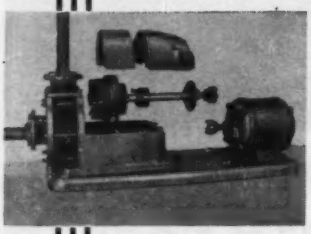
NEW PROCESSING EQUIPMENT developed by *Falls...*

Three times in 1954, new and radically better processing equipment was developed by Falls! These developments have proven to be outstanding and have placed Falls in a position of definite leadership. Watch for developments by Falls in 1955!



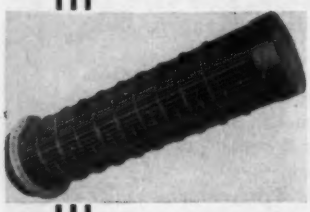
RUPTURE DISK

A new idea in frangibles . . . expendable and economical, these units are now widely used to protect all types of pressured systems and processes from full vacuum to 250 psi. IMPERVITE rupture disks are resistant to almost all chemicals at temperatures up to 300°F., and provide for 100% clean rupture to give a maximum opening for safe escape of excess pressure. WRITE FOR CATALOG.



CENTRIFUGAL PUMP

New, virtually leakproof seal used on IMPERVITE Centrifugal pumps is self-cooled and easily accessible. In addition, the entire line of pumps has been redesigned to increase efficiency of operation and reduce maintenance. After six months continuous operation, one customer said this about IMPERVITE pumps, " . . . to date has required no maintenance of any kind. I consider this an exceptionally outstanding record." Another said, " . . . and has been performing perfectly." WRITE FOR CATALOG.



GRAPH-I-TITE

GRAPH-I-TITE (developed by Graphite Specialties Corp., a Falls Industries associate company) is capable of maintaining its impermeability to temperatures of 5700°F. It opens vast new possibilities for chemical and metallurgical progress, and is currently being used for heat exchanger tubing, special components as well as in conjunction with IMPERVITE resin-impregnated graphite where areas of excessive temperature are encountered. WRITE FOR CATALOG.

Falls Industries Inc.

Cleveland's newest industrial suburb

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THIS MONTH'S

Letters:

Refresher Series

Sir:

In one of the recent issues of *Chemical Engineering* a statement appeared that the future of Chemical Engineering Fundamentals (CE Refresher) depended upon the response of the readers. There were several sections scheduled for a later date, and these were the ones under discussion.

I have enjoyed reading all of the published articles and have been able to learn many new methods of attack for problems which fall in the different topics discussed. Each article has been a very thorough review and has been written so that one can follow the subject without a lot of concentrated study.

Kindly continue Chemical Engineering Fundamentals, as the series have been very beneficial for all chemical engineers and others who may have read them.

NYM K. SEWARD

Chemical Engineer
New Castle, Del.

► *In repsonse to requests such as this, we definitely will continue the CE Refresher series. Within a few month's we'll be able to let you know our plans for the next couple of years.*—ED.

Compressibility Charts

Sir:

The generalized compressibility charts published in the July 1954 issue prompts me to call your attention to a similar set of charts published in 1949 by Worthington Corp. (Worthington Pump & Machinery Corp.) in their Research Bulletin P7637.

It is gratifying to note the closeness of agreement. The only significant deviation between the Worthington curves and those of Nelson and Obert which you published seem to be near the saturation line (Chart 2, p. 205) and for reduced temperature values between 1 and 1.4 with reduced pressures of 7.5 to 10 (Chart 3, p. 206).

Pro & Con

The Worthington charts do not contain values of pseudo reduced volume, so no comparison for these can be made?

HOWARD M. BOTELER

Compressor Consultant
Worthington Corp.
Houston, Texas

► *Readers who valued the Obert-Nelson generalized compressibility charts will be particularly interested to learn about the similar Worthington charts.*—ED.

More on Clippability

Sir:

I want to congratulate you on your policy of making your magazine as readily suitable for clipping as possible. These format changes indicate what seems to be unusual recognition of reader practices and requirements. This editorial awareness accounts in considerable measure for the notable success of your journal.

Without being able to suggest a good way to do it, I can mention an improvement which would make it still easier to remove material for file. The magazine now is so firmly stapled with such heavy staples that it is difficult to take apart. However, I note that the last issue has only two staples. Perhaps this is the minimum which could be used while still keeping the magazine satisfactorily compact.

WINFIELD B. HEINZ

Heinz Engineering Co.
Arlington, Va.

► *All issues now have only two staples, which makes them somewhat easier to take apart. One of the most convenient ways to clip CE articles, however, is by means of a sharp knife or 4 H pencil and a straight edge. This method is clean and quick.*—ED.

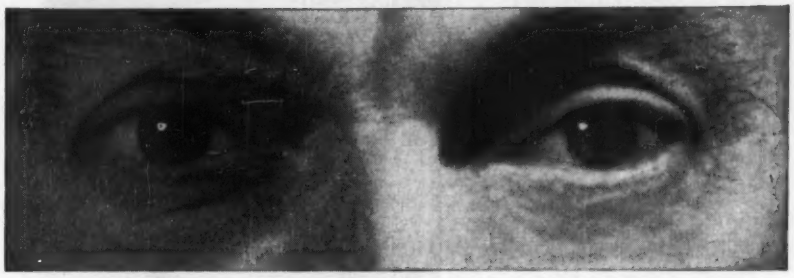
Promises for '55

Sir:

I've just read the short editorial in your January issue entitled "What We Promise for '55" . . .

This impressed me because of your evident and sincere interest

Want Proof?



then trust your own eyes!

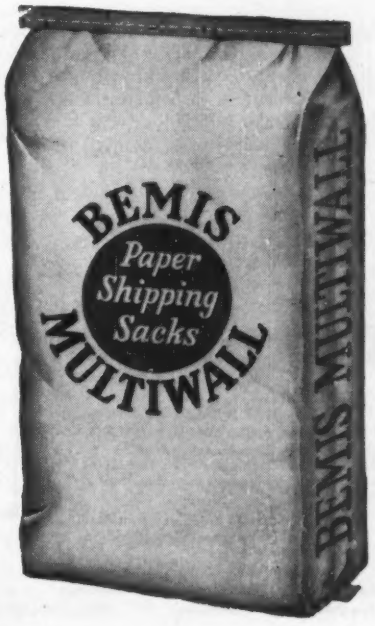
And you will know that Bemis color printing of brands on multiwall paper bags is bright, crisp, color-true . . . the kind that will boost the selling power of *your* brand.

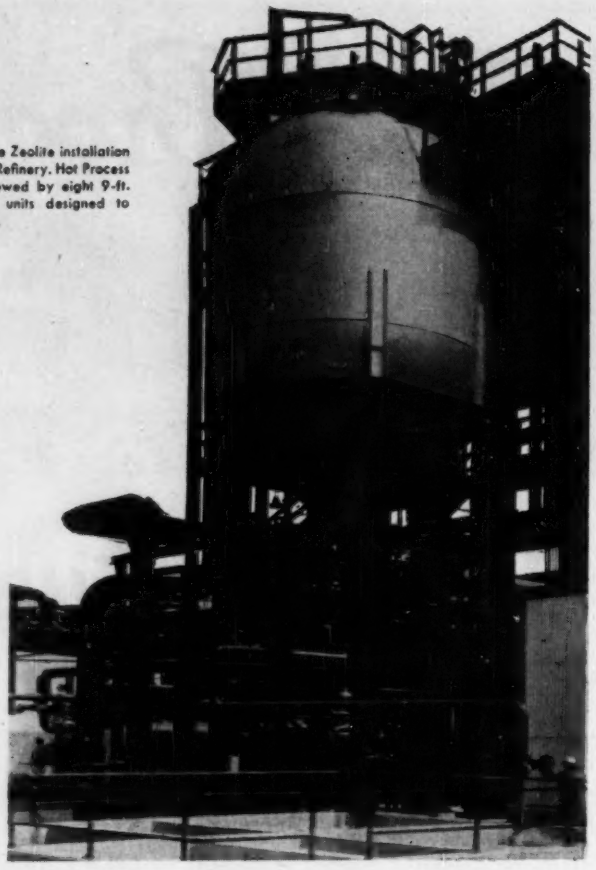
Ask your Bemis Man to show you typical Bemis multiwall printing. Trust your own eyes.

Bemis

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General Offices—St. Louis 2, Mo.
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A Cochrane Hot Lime Zeolite installation in a large Western Refinery. Hot Process unit at right is followed by eight 9-ft. filters and zeolite units designed to 150 lb. ASME code.

Cochrane HOT LIME ZEOLITE

assures higher quality water at less cost

For economical modernization of boiler plants or for new plants . . . investigate the application of Cochrane Hot Lime Zeolite Systems. Consult the pioneer and leader in the Hot Process field.

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in your subscribers' "likes and dislikes." It also made me really realize, for the first time, I guess, how you have already made progress along the same lines. During the past year, for instance, I have noticed much along the lines of "more articles on costs," keeping articles clippable without destroying adjacent articles, less mixing of ads and editorial matter on the same page, more emphasis on theory, "legible drawings" and "readable text."

Congratulations on your achievements . . . thanks for your continued consideration.

JOHN D. WALDRON

Chemical Engineer
Standard Oil Co. (Ind.)
Whiting, Ind.

► *We deeply appreciate such letters, of course, for they give us a lift, make our work more pleasant and rewarding. But to be honest about it, we also get our full share of the brickbat variety. These also serve the very useful (albeit painful) purpose of keeping us on our editorial toes.*—ED.

New Light on Delbay

Sir:

We appreciate very much the attention given to the Delbay process on p. 104 in your January issue of *Chemical Engineering*. The following explanations and qualifications are intended to clear up some of the statements:

► **Nitration**—U. S. experts are justified in doubting "that a 3-4 hr. digestion of wood chips in nitric acid at atmospheric pressure can do the job" if they assume the wood chips to be of the usual size. The Delbay patent states, in one of the specific examples disclosed, that "birch wood is treated for a period between 3 and 48 hr. depending upon the size of the wood particles." Actually the process makes use of very thin chips in order to shorten the digestion period. The thickness recommended is between 0.2-0.4 mm. (of the order of 0.01 in.) and is obtainable satisfactorily and economically with a machine developed in France.

► **Causticizing**—After nitration and washing, wheat straw, for example,

is treated in a weak caustic soda solution without a change in initial appearance and in apparent texture until, toward the end of the causticizing, the straw disintegrates quickly and completely. The whole causticizing is nevertheless a matter of hours and not minutes.

▶ **Nitro-Lignin**—The nitro-lignin is not obtained as a precipitate immediately after nitration, but when the waste waters from the washing operations after nitration and after causticizing are mixed together. This precipitate is valuable as a fertilizer and leaves a final waste water which is neutral, clear, and not foaming.

▶ **Quality of Pulp**—The pulps obtained by the Delbay process are as good, if not much better, than pulps made by other processes from the same raw materials. The possible restriction concerning kraft has nothing to do with the process as such, but only with certain raw material unsuitable for kraft in any case. For instance, pulp made from bagasse by the Delbay process is far superior to bagasse pulp made by the usual soda process, but nevertheless is not equal to actual kraft pulp. Yet paper which is comparable to kraft and, generally speaking a good substitute for it, can be obtained from short fibred bagasse by the addition of a certain amount of long fibred sisal, for example.

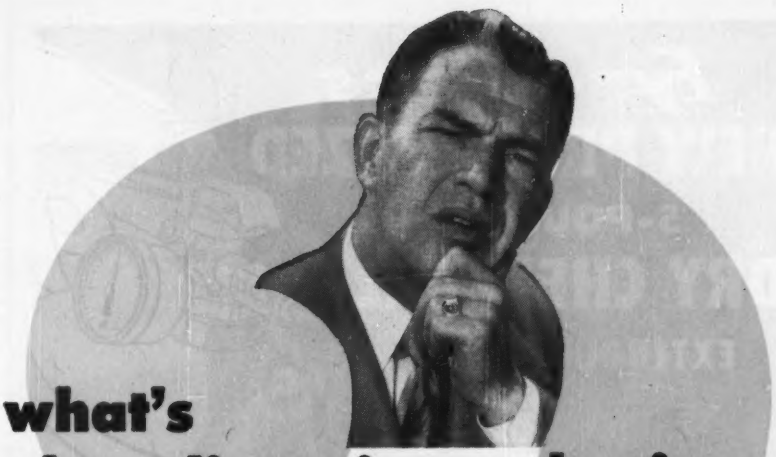
We hope that the above will help clarify these aspects of the Delbay process.

J. WEBER-MARSHALL

Vice President
Council on Public Relations, Inc.
New York, N. Y.

▶ *Engineers in the pulp and paper field will be particularly glad to get this additional information on controversial aspects of the new French process, now being studied with interest by U. S. pulping firms.*—ED.

We welcome short, pertinent letters from our readers giving their opinions on developments in the chemical engineering profession and in the chemical process industries. Address the Editor, *Chemical Engineering*, 330 West 42nd Street, New York 36, N. Y.

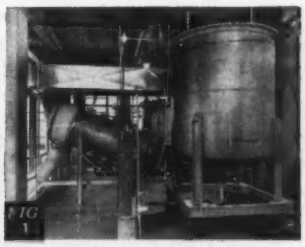


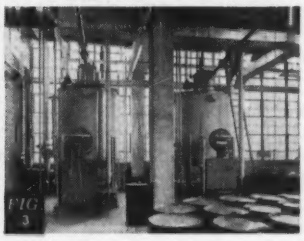
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THIS MONTH'S

Technical

Broad Coverage

DETERIORATION OF MATERIALS — CAUSES AND PREVENTIVE TECHNIQUES. Edited by Glenn A. Greathouse and Carl J. Wessel. Reinhold Publishing Corp., New York. 835 pages. $12.

Probably the outstanding feature of this new book is its breadth of coverage. It treats fully the preservation of a wide variety of materials in common use today including metals; wood products; paper; textiles and cordage; leather; plastics and rubber; paints, varnishes, enamels, and lacquers.

Climate, chemical and physical agents, and biological agents are the deterioration factors covered in Part I. Part II is the discussion of materials and their preservation. Assembled units and their preservation (Part III) covers electrical and electronic equipment, optical instruments and photographic equipment.

The section on special aspects of preservation (Part IV) treats dehumidification, packaging, and toxicological evaluation of preservatives.

Besides manufacturers and engineers generally, the book will be especially useful to personnel responsible for the design, procurement, construction, and maintenance of military and government equipment. Also to warehousers, storage agencies, and transporters.

The book is prepared with the collaboration of 24 specialists under the joint auspices of the Services Technical Committee of the Department of Defense and the Pre-

Recent Books Received

Chemical Engineering Instruments and Control Methods. Ed. by E. Molloy E. Carr. George Newnes, Ltd. 21s.

Foreign Oil and the Free World. By L. M. Fanning. McGraw-Hill. $6.

Electro-Plating & Corrosion Prevention. Ed. by E. Molloy. George Newnes, Ltd. 18s.

The Lipids. Vol. II. By H. J. Deuel. Jr. Interscience. $25.

Bookshelf

L. B. Pope

vention of Deterioration Center, Division of Chemistry and Chemical Technology, National Academy of Sciences—National Research Council.—MMH

Vanishing American

HUGH ROY CULLEN: *A Story of American Opportunity. By Ed Kilman and Theon Wright. Prentice-Hall, New York. 376 pages. $4.*

Reviewed by H. C. Parmelee

Leaving the fifth grade at age 12 to go to work to help support his mother marked the end of formal schooling for Hugh Roy Cullen. Yet many years later the University of Pittsburgh conferred on him the honorary degree of Doctor of Science for his conquest of "heaving shale," one of the most troublesome obstacles in oil-well drilling. Between these two events the fabulous career of Roy Cullen unfolds "a story of American opportunity," as the authors of his biography have subtitled their book. It might also be labeled "A Vanishing American," for Roy Cullen was, and is, the finest type of rugged individualist. But whatever its title, the biography should be read by every young man who grew up during that period in our country's history when it was fashionable to seek security instead of opportunity, embrace safety and shun calculated risks, and let the Great White Father take care of his children. The story will quicken the pulse of any red-blooded American.

Everything that Roy Cullen did was preceded by thoughtful decision, and executed with persistence, courage, faith on himself and in people. His character was the embodiment of honor, integrity, generosity and other virtues inculcated by his mother who was his mentor during his young manhood, and a guiding memory throughout his

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Illustrated here are two distinct types of trays, each different in design and functioning, each subject to modifications to meet special conditions. We shall be glad to send you full details on any and all types. If in requesting this information, you will outline your requirements, we could perhaps at the same time suggest the best type for your operations.



In all our processing equipment—standard or special or made to order—we focus the knowledge and experience of our engineers on the design details and end use. We feel that this engineering service is an essential part of our manufacturing service which covers a wide range of processing equipment, particularly in the fields of distillation, absorption, crystallization, solvent recovery and purification, extraction and similar operations.

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BOOKS . . .

career. Add to all this a rare trait familiarly known as "horse sense," and you have the qualities that made Roy Cullen an exceptional man.

Probably best known as an "oil man" and "King of the Texas Wildcatters," Cullen had previously been a cotton buyer and real estate broker. The "Cullen luck" in bringing in oil wells was proverbial, but the record shows that luck was a minor ingredient of his success. He brought in new fields and revived some that had been abandoned, but there were many disappointments as well. Nevertheless he went his way despite dire predictions of failure in some of his most successful ventures. He had faith.

That he amassed a fortune in oil is of less importance than what he did with his money. His philosophy of philanthropy is to bestow his wealth on charitable enterprises while he can enjoy the fruits of his generosity. Houston has been the beneficiary of his largess through the gift of millions for a university, several hospitals, YMCA and YWCA, Boy Scouts, an art museum and a symphony orchestra. And finally, the Cullen Foundation with an endowment of oil resources worth $160,000,000 has been established as a permanent means of contributing to the growth and development of the Texas institutions to which he has already given so generously. To see his wealth distributed during his lifetime is his idea of "selfish" generosity.

Cullen takes his citizenship as seriously as he does his business and philanthropy. He doesn't "dabble" in politics, he works at it, but not for office or personal advantage. His goal is honest government in the public interest. It can well be imagined that he was the implacable foe of the New Deal and the Fair Deal, their economic and financial follies, their government by bureaucracy and their "creeping socialism." Against them he trained his heavy artillery of full-page newspaper advertising, telegrams and letters without number, speeches and dinner meetings. He was a sincere and effective crusader. His political "horse sense"

foresaw the downfall of Dewey, and led him to espouse the candidacy of Eisenhower while the latter was still president of Columbia University. Although unable to dissuade Dewey from his course, he was successful in promoting the cause of Eisenhower.

Now in his third quarter-century of life, having capitalized on his years of struggle and hard work, Roy Cullen's time is spent in carrying out what Governor Shivers calls "an excellent record of Christian stewardship."

Nine Monographs

ORGANIC ANALYSIS. *Vol. II. Edited by J. Mitchell, Jr., I. M. Kolthoff, E. S. Proskauer and A. Weissberger. Interscience Publishers, New York.* 372 *pages.* $8.50.

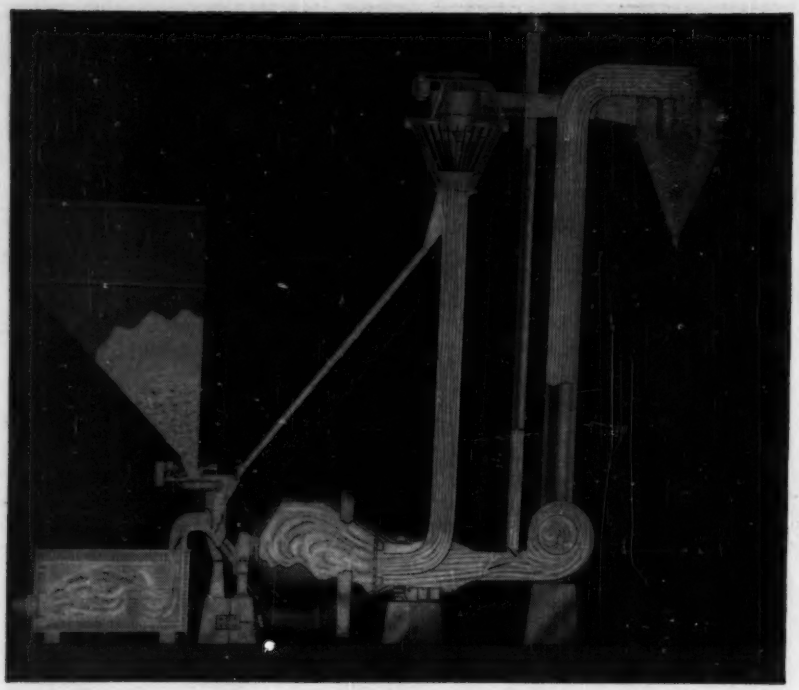
Reviewed by M. M. Tuckerman

The second volume in the series "Organic Analysis" designed to "acquaint chemists in academic institutions and in industry with reliable and critical information on general methods," contains four monographs on functional group analyses and five on techniques.

Al Steyermark contributes a brief but thorough chapter on the micro-determination of carboxyl groups (neutralization equivalent) with copious reference to original articles and reviews. R. T. Hall and W. E. Shaefer write a comprehensive review of the determination of esters. A summary table of methods adds to the utility of this chapter.

Working directions and sample calculations as well as a summary table of procedures, aid in utilizing the methods for the determination of nitro, nitroso and nitrate groups contained in the 52 pages provided by W. W. Becker and W. E. Shaefer. T. Higuchi, in a well-written 53 page chapter, presents an orienting introduction to the application of lithium aluminum hydride to organic analysis and indicates areas for further in-





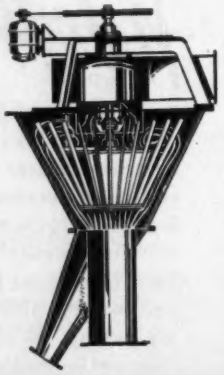
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BOOKS . . .

vestigation. W. D. Cooke discusses the theory, techniques and applications of coulometric methods in a most informative manner.

Reference to bibliographies and reviews allows P. J. Elving a 43 page discussion of the practical factors involved in the application of polarography to organic analysis. T. S. Lee makes good use of specific examples and procedures in a densely packed 16 pages of methods based on reaction rate. W. J. Mader contributes a comprehensive monograph on phase solubility analysis which contains sections on phase rule and theory, specific procedures and applications.

In an extensive, well-written and scholarly treatment of countercurrent distribution, J. R. Weisiger expounds the theory and mathematics of his subject, discusses the influence of various factors on solute distribution, and describes some operations and equipment as used by L. C. Craig and co-workers. A bibliography of review articles provides access to specific separations.

Integration of chapters on technique with those on functional group analysis is attempted, although there is a seemingly unavoidable duplication of a few references. The second volume of "Organic Analysis" is a worthy companion on the reference shelf to Vol. I which it resembles in binding and typography. A combined general subject index to both volumes is included.

First of Three

THE CHEMISTRY OF PETROLEUM HYDROCARBONS. *Edited by Benjamin T. Brooks, Cecil E. Boord, Stewart S. Kurtz, J., and Louis Schmerling. Reinhold Publishing Corp., New York. 664 pages. $18.*

Reviewed by Kenneth A. Kobe

A group of 60 men, each well-known in his field of specialization, has prepared a treatise on the scientific fundamentals of petroleum hy-

drocarbons. Its coverage is such that three volumes are necessary to include the material. The petroleum hydrocarbons themselves are discussed, rather than all of the derivatives that are or can be produced from them, which might soon be a large part of the entire subject of organic chemistry.

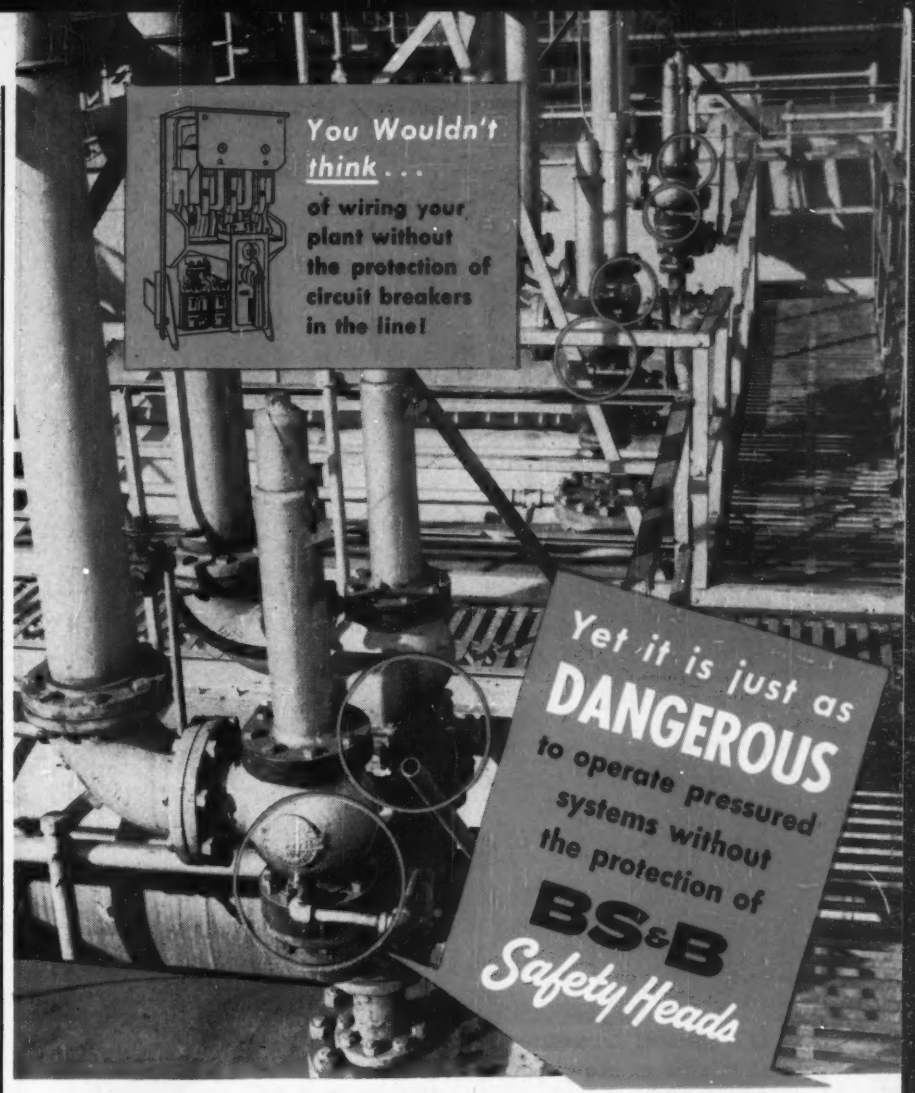
Industrial processes are included, for example, the Fischer-Tropsch process appears in this volume. To understand the hydrocarbon reactions, the probable mechanisms are discussed. It is fitting that this series is dedicated to two pioneers in the field of fundamental chemistry of hydrocarbon chemistry and reactions: Vladimir N. Ipatieff and Frank C. Whitmore.

Without actually being divided into sections, the chapters logically fall into groups that progress from composition of petroleum to methods of separation, physical properties, analysis and synthesis.

The first section shows that hydrocarbons have been found in natural gas, petroleum fractions from gasoline to wax, how they combine to form various types of crudes, how shale oil differs, and finally how they got their start as petroleum.

The chemical engineer will be pleased with the newer separation methods used: extractive and azeotropic distillation, selective adsorption, solvent extraction and extractive crystallization with urea and thiourea. The time-honored unit operations of distillation and filtration are properly considered to be sufficiently well-known to be omitted in favor of newer material, as extractive crystallization.

Much work has been done on the correlation of hydrocarbon structure with physical properties, and this work is summed up concisely. The methods of calculating thermodynamic properties from molecular structure and spectroscopic data are presented briefly. The ultraviolet, infrared and Raman spectra are applied to the analysis of hydrocarbons. Mass spectroscopy is shown to be a new tool of increasing importance in the analysis of petroleum and characterization of hydrocarbon types.



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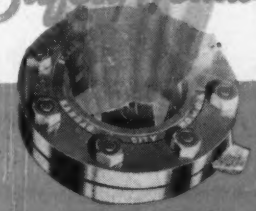
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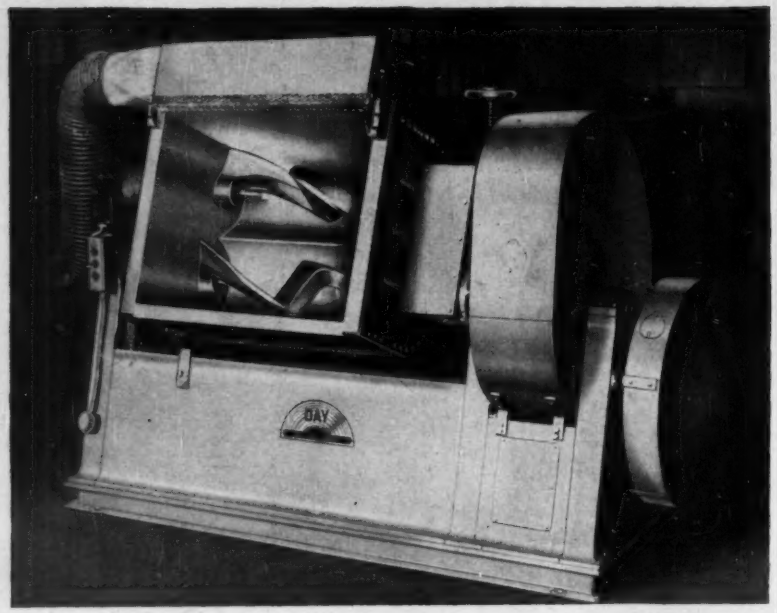


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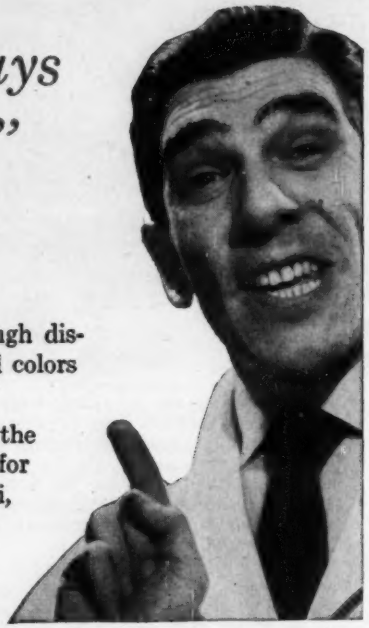
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BOOKS . . .

With the heavier hydrocarbons, other methods must be used, as physical properties, the n-d-M method, extraction, selective adsorption and thermal diffusion.

Four chapters are devoted to methods of synthesis of hydrocarbons: pure paraffins and olefins, low molecular weight alicyclic, low molecular weight aromatic, and high molecular weight hydrocarbons. The methods discussed are those used by API projects for the preparation of considerable quantities of new hydrocarbons. The last chapter begins industrial syntheses with the Fischer-Tropsch process, essentially German practice and U. S. Bureau of Mines results.

Everything known about petroleum hydrocarbons and their chemistry cannot be contained in a three volume set. The reader will not find everything he may want, but he certainly will find the most important and authenticated results or methods. The set will belong in the library of every engineer and chemist interested in petroleum chemistry or processing.

Engineering Thermodynamics

TECHNISCHE WAERMELEHRE. By F. W. Winter. Published by W. Girardet, Essen, Germany. 312 pages. DM 19.80 or $4.60.

Reviewed by Max Wulfinghoff

Within the covers of this volume the reader finds a comprehensive review of engineering thermodynamics, beginning with an introduction into fundamental concepts, and ending with an outlook into the future of the internal combustion engine. 50 pages are devoted to basic knowledge including methods of measurement and principles of chemical thermodynamics. The next 100 pages deal with heat effects upon solids, gases and liquids. The following 100 pages cover reciprocating heat engines, gas mixtures, vapors, steam power and mechanical refrigeration.

The heat pump is discussed in a

succinct manner. Twenty pages are on fuels and combustion, and the last 25 pages give the essential theory of, and performance figures for, gas turbines and jet engines.

There are 240 carefully selected and neatly executed diagrams and line drawings accompanied by a wealth of tabulated data, and historical and literature references in handy footnotes.

The text is brief and pithy, matter-of-fact, up-to-date, and there are many numerical examples taken from various industrial applications. A most serviceable presentation which is recommended to anyone interested in heat engineering and able to read technical German. For the convenience of teachers, the diagrams are also available as lantern slides of standard dimensions.

Outstanding

PHYSICAL CHEMISTRY OF DYEING. *Second edition. By Thomas Vickerstaff, Interscience Publishers, New York.* 540 *pages.* $7.50.

Reviewed by R. Eck

Since the first edition in 1950, the importance of this book has been widely recognized. It is really outstanding in its conception as well as its presentation. There is no other book that conveys the understanding of the underlying principles of dyeing processes as this one does.

The author was a well known contributor to the field even before this undertaking. It is, therefore, no surprise that his book is written with great competence. Further, the author employs great clarity in his writing. Proved physical-chemical researches which had appeared in a variety of scientific publications were combined with the author's own observations in a systematic way. In line with the scientific spirit, the author rather says, "It is claimed" in such cases which are proved only partially.

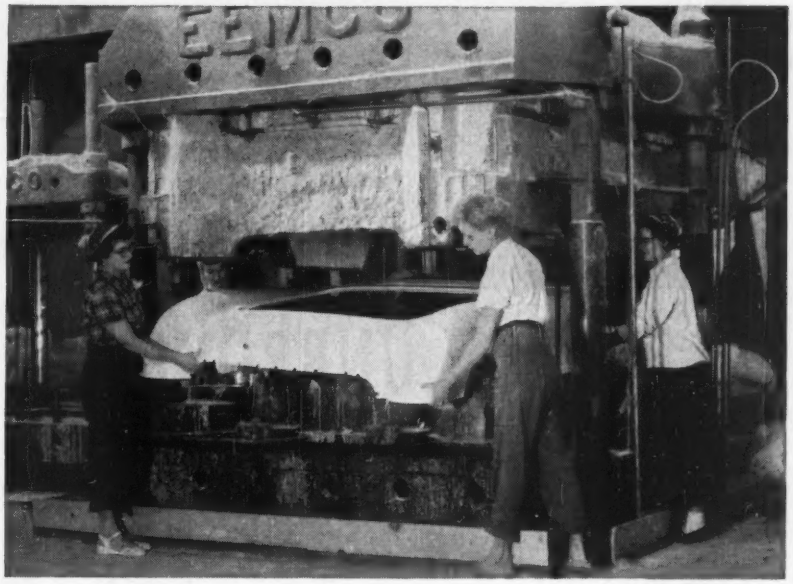
The book consists of a "General" and a "Specific" part. The general part brings a deep insight into the problem, treating such subjects as colloidal properties of dye solutions,

Burning Issues

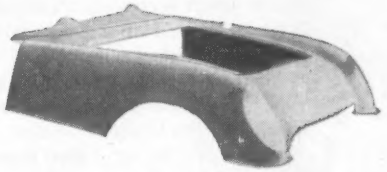
Eclipse

Published by Eclipse Fuel Engineering Company
Rockford, Illinois

Eclipse "Steamboilerplants" chosen for processing first all-plastic sports car bodies!



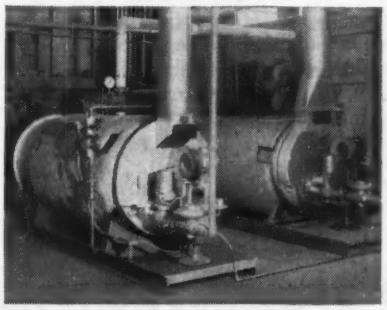
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Steam for body dies is supplied by these 40 and 50 horsepower Eclipse Super-Matic Scotch "Steamboilerplants" fired by Eclipse Dual-Fuel Burners.

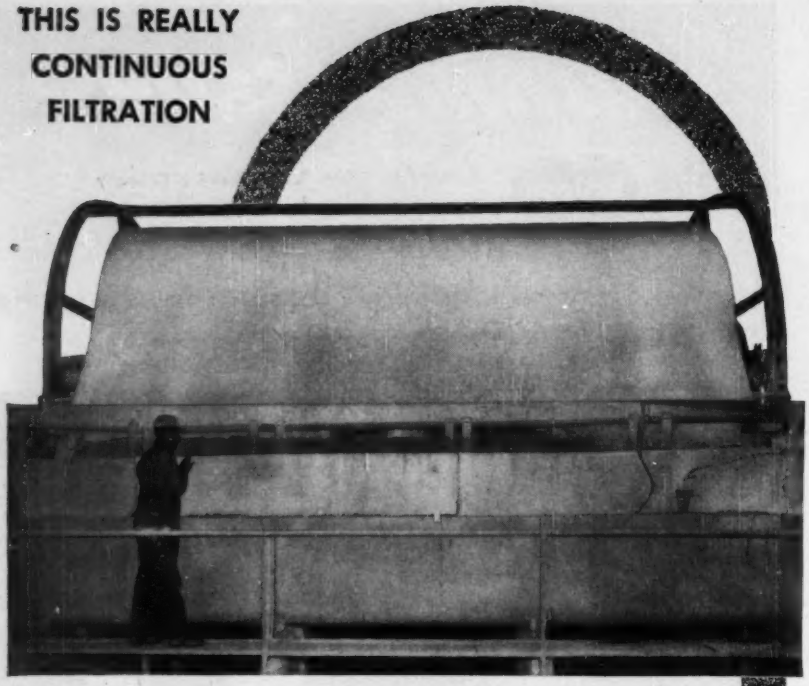
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dyeing equilibria and the kinetics of dyeing. The last chapter is especially valuable. The specific part treats the dyeing behavior of the different fibers. Instead of treating the subject in the empirical fashion, he makes great effort to search for the fundamentals.

The new edition is greatly enlarged and thoroughly revised. It consists of 14 chapters with 540 pages against 12 chapters and 416 pages for the first edition. Also, the number of tables and figures is increased considerably. One of the new chapters treats the commercially important "Dyeing of Cellulose with Dyes." In it the reduction of vat dye (reduction potentials and rate of reduction), and the obsorption of the leuco compound are especially well done.

The other new chapter tells of the dyeing of hydrophobic fibers such as the polyvinyl polyacrylic and polyester types. The reader will welcome the concrete facts given on the "High Temperature Dyeing" and on the "Cuprous Ion Method." The author is aware that the dyeing of hydrophobic fibers is still in a state of flux.

The reviewer has the highest esteem for this work and any criticism is presented with hesitation. It is unfortunate that the author has not as yet included a few subjects that are encountered in present day dyeing practices. The abstractor has in mind sequestering agents of organic and inorganic type. The former one is gaining importance in chrome dyeing and the latter has been used generally. It might also be added that a potentially large number of American readers would like to find the name Dacron mentioned as synonymous with Terylene, even if it were mentioned only in a footnote. While the enlargement of the subject index as well as the author index will be favored, the omittance of the dye index may be missed.

In conclusion, there can be no doubt that this revised edition will be appreciated by all scientific workers whose field is related to dyeing. Furthermore, it is to be hoped that this book will be studied by practical dyers, as well as by chemists.

The deeper understanding obtained could and should in due time lift the art of dyeing to a higher level.

Solvents Is Solvents

THE TECHNOLOGY OF SOLVENTS AND PLASTICIZERS. *By Arthur K. Doolittle. John Wiley & Sons, New York.* 1,056 *pages.* $18.50.

SOLVENTS AND ALLIED SUBSTANCES MANUAL WITH SOLUBILITY CHART. *Compiled and Edited by C. Marsden. Elsevier Press Inc., New York.* 429 *pages.* $12.95.

Reviewed by C. L. Mantell

After careful reading of the above excellent volumes, the reviewer must conclude that a solvent is a solvent, inasmuch as he had difficulty finding a definition of the term.

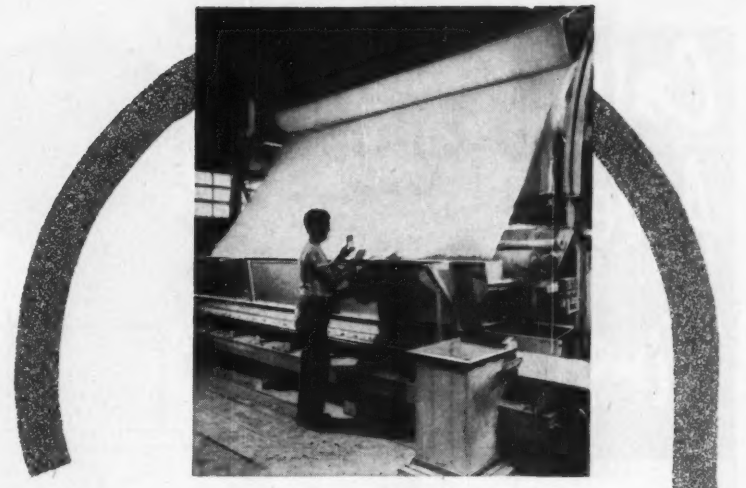
Doolittle devotes the first thirty-four pages to a general scope of solvent and plasticizer utilization and says:

"Although the solvent industry was originally devoted almost exclusively to the manufacture of solvents for dissolving substances, this situation is no longer true. Many products that formerly were employed principally as solvents now find their main outlet as chemical intermediates, as components of antifreeze compositions or hydraulic fluids, or in other nonsolvent applications."

The next chapter concerns itself with an "Introduction to the Technology of Solvents for Resinous Substances."

"It is unfortunate that the most significant characteristic of solvents, namely, the ability to dissolve or to be dissolved by given classes of substances, is the one about which the least is known. The situation is somewhat better if the objective is merely to determine which is the best or strongest of several solvents known to dissolve a given substance."

The next chapter of some 76 pages discusses nitrocellulose lacquers.



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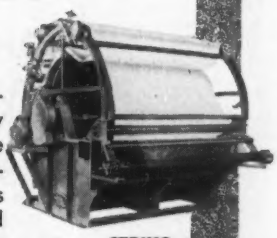
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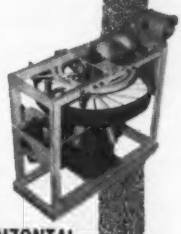
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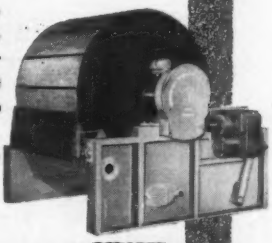
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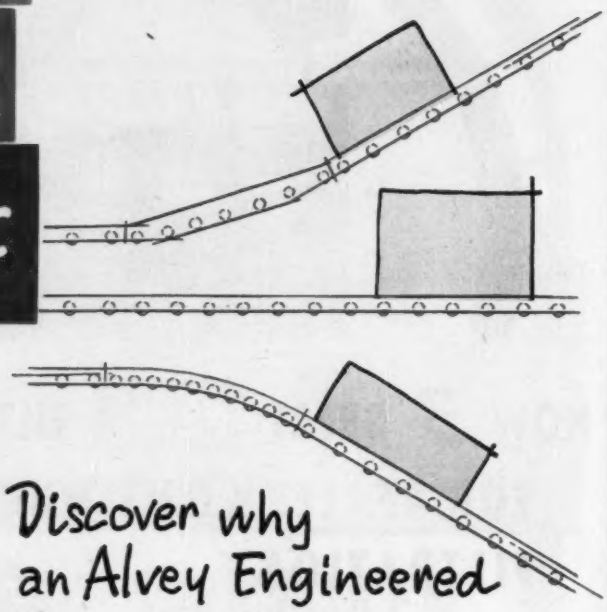
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BOOKS . . .

"Much of the technology of solvents has been developed by and for the coatings industry, since this field represents the largest outlet for solvents for strictly solvent purposes."

The following chapter discusses vinyl resin coatings.

"The solvent technology of the vinyl resins differs considerably from that of nitrocellulose, although active solvents and diluents are employed in both. Consequently, it is often thought of as 'special' in comparison with the behavior of the more conventional pyroxylin coatings. No extensive literature exists on this special technology, in spite of the widespread industrial application of vinyl resins."

This vinyl resin coatings is some 70 pages, followed by a 36-p. chapter on convertible and miscellaneous finishes, and a 27-p. chapter on the technology of application.

By this time the reader has met solvents which are solvents, nonsolvents, thinners, diluents, plasticizers, replacements, substitutes, and solvents which do not have any solvent property or which are not used for dissolving at all.

The next chapters cover technology of application, solvents for textile fibers, solvents for adhesives, and a closely related chapter on solvent recovery, with a related section on handling and shipping of solvents. This is a concise industrial application section of 125 pages.

The middle section of the book is an encyclopedic compilation of the properties of those materials termed solvents, dealing with their properties of groups and their properties as individuals. The next section deals with the discussion of liquids from both the theoretical and practical aspects and the theory of solvent action primarily from the thermodynamic and psysicochemical viewpoint.

The last section pp. 862-1,027, deals with plasticizers and plasticization, their theory, mechanism, evalution, properties as groups and properties as individuals, in a manner analogous to the treatment of solvents.

Doolittle's work is monumental and encyclopedic, representing an extremely valuable addition to the literature on solvents and plasticizers. It will be found to be an excellent reference handbook, well documented and indexed, and to date without a peer. It should be on the bookshelf of every worker in the field as a necessary tool.

Marsden's book is stated to be a reference for industry especially concerned with paints, lacquers, varnishes, pharmaceutical products, perfumery and cosmetics, essences, soaps, lubricating oils, dyestuffs and pigments, petroleum refining, textile processing, dry cleaning, rubber processing, and plastics. It is essentially a book with a British viewpoint, listing the properties of individual solvents without the inclusion of plasticizers. There is little text discussing application hazards, theory, or practice. As such, it is of far more limited scope than Doolittle's monograph, and represents the work of an assiduous compiler but without the extensive research and development background of Doolittle and his associates. It should constitute a reference work but of somewhat limited scope.

Travelogue

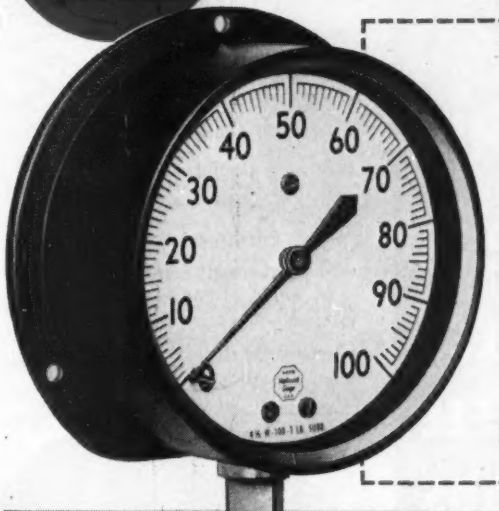
TALES OF A SUGAR TRAMP. *By Emile C. Freland. Pelican Publishing Co., New Orleans.* 311 *pages.* $5.

Reviewed by Dan Gutleben

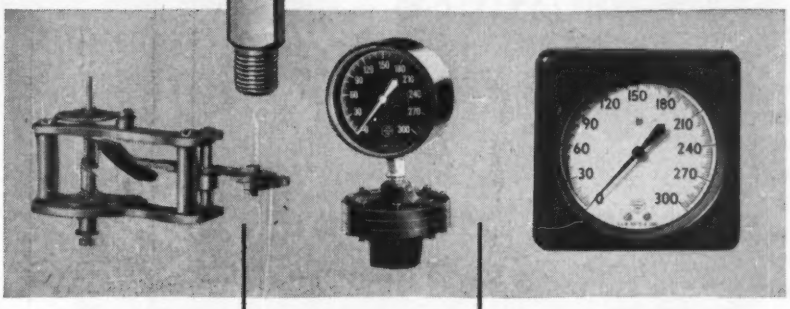
Freeland's sugar career began in 1920 when he left the L.S.U. sugar school with a fresh diploma for a four-year tour in a British Guiana sugar mill. His "Tales of a Sugar Tramp" concerns itself for the most part with scenery, climate, fiestas, excursions into the tropical jungle and the eating and drinking habits in the Tropics. He risks his life by lying on his stomach at the edge of a precipice and projects his head beyond an overhanging rock in order to get a view of a terrific chasm and to see a river tumbling into a gorge a fifth of a mile deep. His description of what he saw com-

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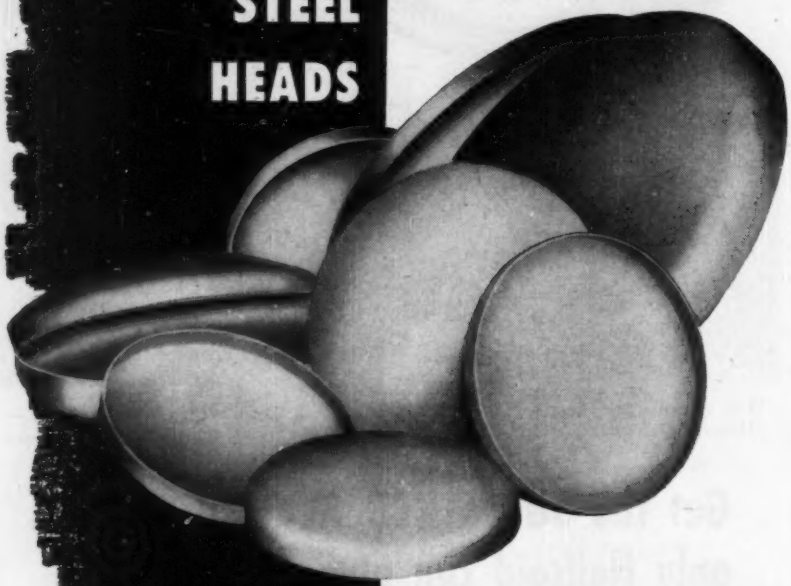
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BOOKS . . .

petes with the *National Geographic*, lacking only the illustrations.

There is the impression that in the pursuit of life and happiness in the tropical sugar plantation, ambition and urge to performance is geared to the small effort required to earn the minimum needs of existence. This circumstance, as the book indicates, is favored by manna from heaven in the way of bananas, fish, game, timber and tremendously fertile soil which produces up to 10 crops of cane for one planting. The big occasion for the villagers is the periodic fiesta. There is the inevitable bull fight and the special emphasis on hard liquor consumption as well as the joy in the process of achieving the end result in spite of the price of "the cold gray dawn of the morning after." The tropical plantation attache seems to lack diversification in means of driving away dull care.

After four years of tropical eating, drinking and living, the author's health deteriorates and providentially he is transferred to New Orleans to direct traffic and distribution of Cuban cargoes of molasses. This provides the occasion to describe life on "Ole Man River," the great spectacle of Mardi Gras and two episodes in connection with trips on the molasses Tanker "Bulko" to Cuba. In the first episode, the author, through the egregious stupidity of a pair of Cuban policemen, learns what it is like to spend a night in a smelly hoosegow. In the second episode, the third engineer suddenly decamps as the Bulko tarries in New Orleans.

Adventitiously a substitute presents himself fresh from a three-week residence in a Tampa jail of nauseating accommodations. He had unwittingly signed up on a ship which trafficed in contravention of the immigration regulations —and he "thanked God" for the good luck that prompted his predecessor to provide a vacancy for him. At the Cuban port, the seamen promptly flocked to the grogshops which line the water front. They all returned safely up the ladder. However, the new third engineer, a little drunker than the rest, fell

overboard and lost his life. When the casket was about to be consigned to the grave, the coroner suddenly decided that he must conduct an "inquest." No doctor was available but there was at hand a carpenter. With the aid of a chisel and a hammer, he split the victim's skull just as he might have split a coconut. Thereafter the coroner was satisfied and the burial ceremony was concluded.

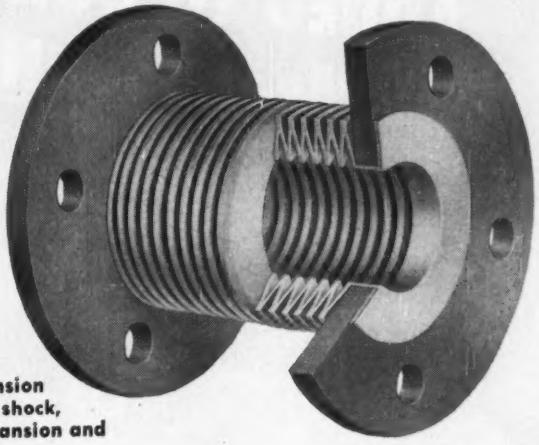
There follows an inspection of three Cuban mills, which is now comfortably possible by luxurious buses operating over the broad Central Highway "built not so many years ago." The "Sloppy Joe" saloon is conveniently available near the bus terminal. The task is accomplished in a few days. At this point the sugar tramp above referred to, would have appreciated some anecdote concerning some sugar house character or peradventure some mechanical peculiarity of the works.

After the two-year molasses traffic assignment, the author achieves his "permanent" job. It appears that he becomes connected with some international outfit concerned with development of sugar and mining operations. He has made at least 30 long tours from New York to various South American countries.

The final chapters provide description of tremendous scenery, the climate, the habits of the people, dictators, Neptune parties, birds, animals, eating and drinking and railroad locations which exhibit the highest of engineering boldness. A sulfur deposit is inspected on an extinct volcano at an elevation of 20,000 feet—so high as to make breathing difficult and inflicting headache except in the case of the natives who have developed large lung capacity.

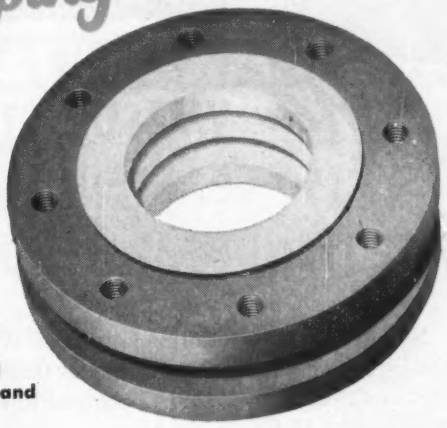
If "Freel" writes another book on sugar tramping the present reviewer will buy it and his wife will also read it. But it is to be hoped that it will include more of the human byproduct of sugar house operation. Furthermore a travel log requires a map and profuse illustrations but the character of the loyal sugar craftsman requires nothing more than simple English.

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THIS MONTH'S

Recent Books

Mass Spectrometry

Principles and uses of mass spectrometry in analysis, in investigating free radicals, in measurement of isotopic abundances. 135 pages.

"Mass Spectrometry." By A. J. B. Robertson. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $2.

Organics

Annual publication which, this time, includes verified methods for preparation of 34 organic chemicals. 121 pages.

"Organic Syntheses." Vol. 34. Edited by W. S. Johnson. John Wiley & Sons, New York. $3.50.

Arizona

A complete directory of Arizona manufacturing establishments: number of plants, officers, products, number of employees—by subject and by community, 60 pages.

"Directory of Arizona Manufacturers" Valley National Bank, 303 Security Bldg., Phoenix, Ariz.

Vertical Pumps

A comprehensive digest of collected data. Engineers will find it a valuable addition to their reference libraries. It covers construction, design, performance, selection, application, formulas and data. 392 pages.

"The Vertical Pump." Johnston Pump Co., Pasadena, Calif. $10.

Rotary Kilns

A discussion, at considerable length, of the performance of rotary kilns, reasons for their deficiencies, and the manner in which these may be corrected. 89 pages.

"The Rotary Kiln." By Victor J. Azbe, Azbe Corp., St. Louis 24, Mo.

& Pamphlets

Management Guide

This is one of the General Management Series published by the AMA. The nine papers included, all deal with methods for organizing management effort in a buyer's market. This can be done by such things as improving effectiveness of salesman, and managing for profit through planning, organizing and controlling. 75 pages.

"The Challenge of a Buyer's Market." American Management Association, 330 West 42nd St., New York 36, N. Y. $1 members, $1.25 nonmembers.

Smog

Report No. 2 summarizes data on the relation of the effluents of combustion processes to Los Angeles smog. The largest quantities of air contaminants in Los Angeles originate with combustion processes in homes, motor vehicles, power plants and industrial processing equipment. The report examines the published findings and indicates areas of disagreement. 63 pages.

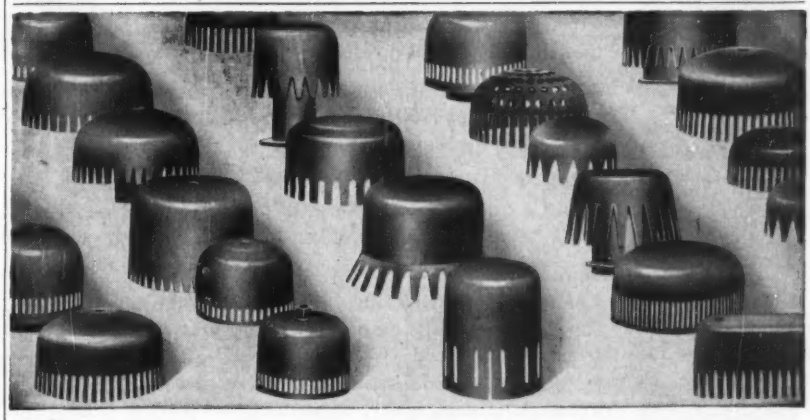
"Combustion and Smog." By W. L. Faith. Southern California Air Pollution Foundation. 704 South Spring St., Los Angeles 14, Calif. $3.

Solubility Charts

New graphical method provides a means for determining solubilities of long-chain organics. Method is the basis for 138 solubility charts involving 11 homologous series of long-chain organics and 17 different solvents over wide temperature ranges. 86 pages.

"Solubility Charts for Homologous Long-Chain Organic Compounds." By R. E. Boucher and E. L. Skau. ARS-72-1. Southern Regional Research Laboratory, 2100 Robert E. Lee Blvd., New Orleans 19, La.





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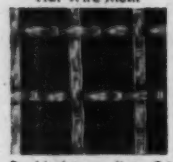
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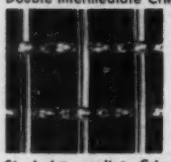
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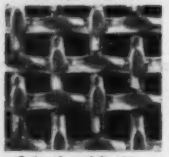

Flat Wire Mesh

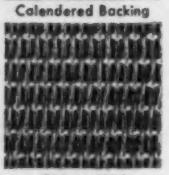

Double Intermediate Crimp


Single Intermediate Crimp


Double Crimped

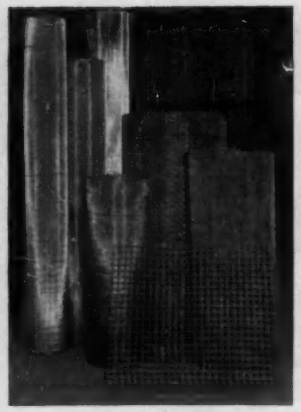

Twilled Weave

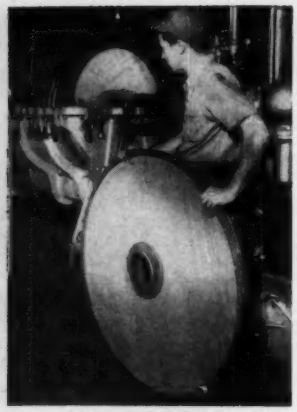

Calendered Backing


Oblong Mesh


Plain Dutch Filter


Twilled Dutch Filter





NO MATTER HOW YOU BUY

INDUSTRIAL WIRE CLOTH

in bulk from stock | or special fabrications

YOU CAN RELY ON

Cambridge

COMPLETE LINE—Cambridge stocks include a wide variety of specifications from the finest to the coarsest mesh in any metal or alloy.

QUALITY—Accurate mesh count and uniform mesh size are assured by individual loom operation and careful inspection just before shipment.

PROMPT SERVICE—You get immediate delivery on the most frequently used types of cloth. If your needs are not in stock, we'll schedule our looms to get your material to you without delay.

CAMBRIDGE ENGINEERS, both in the home office and in the field, are fully qualified to help you select the cloth to meet your needs, whether you order in bulk or special fabrications. In fabricating parts of any type . . . filter leaves, strainers, sizing screens . . . we'll work from your prints or draw up prints for your OK.

LET US QUOTE *on your next order for wire cloth. Call your Cambridge Field Engineer—he's listed under "Wire Cloth" in your classified telephone book.*

OR, WRITE DIRECT for FREE 80-page CATALOG and stock list giving full range of wire cloth available. Describes fabrication facilities and gives useful metallurgical data.



The Cambridge Wire Cloth Co.

WIRE CLOTH | METAL CONVEYOR BELTS | SPECIAL METAL FABRICATIONS

Department G, Cambridge 3, Maryland

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

THIS MONTH'S

Firms in

New Representatives

Hungerford & Terry, Inc., Clayton, N. J., has appointed Ross Engineering, Chicago, to handle its water conditioning equipment.

Midland Chemical Corp., Dayton, Ohio, has selected Davis & Davis as manufacturer's representative for resins and Dextran chemicals.

Hercules Powder Co. has named the Denver Fire Clay Co. as a distributor in the Rocky Mt. area.

Republic Mfg. Co., Cleveland, has appointed Power Transmission Co. So. Bend, Ind., to handle its line of industrial valves.

Hygrade Atlas Inc. has given exclusive representation of all products to U. S. Hoffman Machinery Corp.

Strong, Carlisle & Hammond Co., Cleveland, has appointed Seco Industries, Inc., N. Y., to handle its steam specialty line.

Technology Instrument Corp., Acton, Mass., has named Louis A. Garten & Associates, as representative in metropolitan New York.

Parker Appliance Co., Cleveland, has selected Vincent Brass & Copper Co., Minneapolis, as distributor of Hoze-lok fittings.

Gabb Special Products, Windsor Locks, Conn., has named the U. S. Supply Co., as New England agent for its Shear-Flow mixer.

Chadeloid Corp. has appointed Davis & Davis, Chicago, as agent for its new line of vehicles and resins for the wood finishing field.

the News

M. A. Gibbons

Childers Mfg. Co., Houston, has named the Power Plant Efficiency Co., Indianapolis, as agent for its weather-proof jacketing.

Bacon Industries, Inc., has selected the Fred Peterson Co., Minneapolis as agent for its specialty molding products.

Parker Appliance Co., has appointed the General Sales, Inc., firm, Amarillo, Tex., as a tube fitting distributor.

Kinetic Dispersion Corp. has appointed the Philip E. Calo Co., Inc., as distributor in the Chicago area.

Ebert Electronics Corp. has named the Kriegner Sales Co., Camden, N. J., as representative for its line of mercury plunger relays.

Carver Pump Co. & the **Engine Div. of National Supply Co.** have appointed Robert Goldsmith Co. as representative.

Conoflow Corp. has selected the Williams Equipment Co., New Orleans, to serve Cono controls.

New Locations

Simplex Valve & Meter Co., has moved from 68th & Upland Sts., Philadelphia, to 7 East Orange St., Lancaster, Pa.

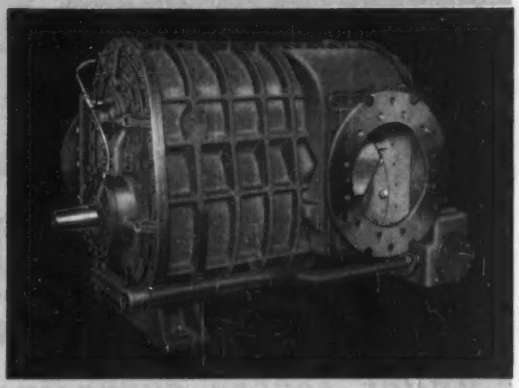
Vanton Pump & Equipment Corp., Empire State Bldg., has removed its offices to its plant location in Hillside, N. J.

New Facilities

Pacific Forge, Inc., So. Fontana, Calif., has contracted the J. B. Gill Co., Long Beach, Calif., to build a $1 million forge plant.

Southwestern Plastic Pipe Co., div. of Texas Vitrified Pipe Co., has doubled its Texas facilities.





Moves more gas or air, with less wear...

...and less maintenance and power costs than other blowers of equal weight and size.

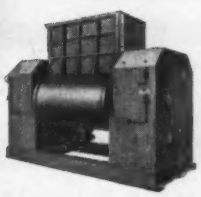
You'll find the *Standardaire* Blower offers you a wider range of pressures with a minimum of internal losses, because the *Standardaire* employs a proved principle of compressing gas or air on a modified adiabatic cycle.

The rotors of the *Standardaire* Blower are accurately machined to very close running tolerances, and provide continuous sealing throughout the entire length of their engagement. Therefore, the high pressure gas or air is confined at the discharge end of the Blower and leakage lines are much shorter than on other types of blower units.

Get all the facts today . . . write

READ STANDARD
CORPORATION

BLOWER-STOKER DIVISION
370 Lexington Avenue
New York 17, New York



Read Standard also manufactures a complete line of chemical mixers for laboratory and industrial use. For information write, Read Standard Corp., York, Pennsylvania



on-the-job PROOF!

Test patch of Phenoline 300 at passenger car wash station of a large Eastern Railroad. Patch was subjected to continual spillage of acid cleaning compound (sulphuric) and extremes of weathering. Material applied as 2 coats with total thickness of ⅛ inch. After 1 year of service, almost ½ inch of unprotected concrete had corroded away. Phenoline-protected concrete remained unaffected with bond of Phenoline to concrete still perfect.

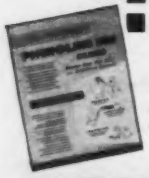
PHENOLINE 300

protects concrete...

under severe corrosive conditions

Structural weakening . . . hazardous footing . . . accumulation of water and corrosives . . . expensive replacement. These are a few of the costly results when floors, pump bases and other concrete areas are not protected from corrosion. This wasteful destruction can be prevented—even under very severe corrosive conditions—with Phenoline 300.

- **Highly resistant to acids, alkalies, solvents.**
- **100% solids.**
- **Can be applied over new or old concrete, asphalt, brick or wood.**
- **Fast thermo-setting at room temperature—no baking required.**
- **Easy to wash down and keep clean.**
- **Protects against back-pressure and seepage.**
- **Can be troweled, brushed or sprayed.**
- **Available in any color.**



WRITE TODAY *for new Phenoline 300 Series Bulletin, 4" x 4" sample of troweled Phenoline, corrosion data and prices.*

carboline COMPANY

A Division of Mullins Non-Ferrous Castings Corporation

Specialists in Corrosion Resisting Synthetic Materials

337 Thornton Ave., St. Louis 19, Mo.

FIRMS . . .

Nat'l Vulcanized Fiber Co. will open a sales office in Newark, N. J., in the Industrial Office Bldg.

Beckman Instruments, Fullerton, Calif., has inaugurated a new field engineering activity designed to assist in instrumentation applications.

Graver Water Conditioning Co. has opened a new Texas district office in Houston.

Chicago Belting Co. has consolidated its subsidiaries: the Allis Rubber Corp. and the Allis Seal Corp. into Chicago-Allis Mfg. Corp.

Ideal Cement Co. will expand operations in the Pacific northwest through a merger with Superior Portland Cement, Inc., Seattle.

Mid-South Chemical Co., Memphis, Tenn., will place in operation a 5 million gal. storage system for anhydrous ammonia.

General Electric Co., chemical div., has established a western regional office, in San Francisco, for decorative plastics.

Patterson-Kelley Co., East Stroudsburg, Pa., plans a new reaction-distillation pilot plant.

Eastman Kodak Co. will open a new sales office in Memphis, Tenn., to handle products in the cosmetic and pharmaceutical fields.

Metasap Chemical Co., Harrison, N. J., has opened a new laboratory for research on metallic soaps.

Shell Chemical Corp. has completely absorbed Julius Hyman & Co., Denver producer of insecticides.

Leeds & Northrup Co. has awarded the contract for the construction of its $2¾ million plant in No. Wales, Pa., to Baton Construction Co., Philadelphia.

American Meter Co. has acquired the Philadelphia Pump & Machinery Co., Inc., as a subsidiary.

Eclipse Fuel Eng. Co., Rockford, Ill., has acquired the assets of The Mettler Co., Inc., Los Angeles.

Lunn Laminates, Inc., Huntington, Sta., N. Y., has acquired the Ueber Tool & Mfg. Co., Detroit.

E. I. duPont de Nemours & Co., Inc., has established a new sales section and technical service group for its petrochemicals div.

Beryllium Corp., Reading, Pa., has opened a new sales office in Houston, Texas.

Union Oil Co., Los Angeles, plans a $1 million expansion to its research center at Brea, Calif.

Machinery & Equipment Corp. has announced the merger of the Wolf-Perry Machinery Co., Newark, N. J.

Hungerford Plastics Corp., Rockaway, N. J., has purchased the equipment and other assets of Walsamer, Inc., Riverdale, N. J.

Battelle Memorial Institute has completed the first units of its $300,000 program for pilot plant research in Columbus, Ohio.

Permacel Tape Corp. has completed its new warehouse in Detroit for expansion in the field of industrial tape.

Abbott Laboratories has opened a new sales and distribution center in Boston.

Carborundum Co. has established a new operating unit—the Electro Minerals Div.—to handle silicon carbide and fused alumina crudes.

The Hart Products Corp., N. Y., N. Y., has established a $100,000 expansion of its Jersey City, N. J., surfactant plant.

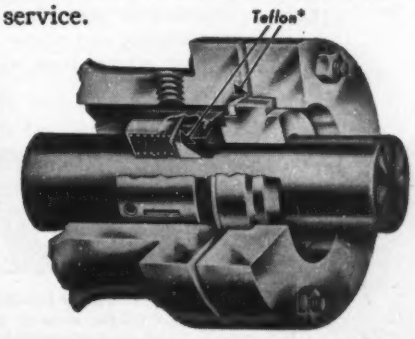
HANDLING CORROSIVES LIKE THESE?



JOHN CRANE *Type 9* **MECHANICAL SEAL**

Performance records plainly prove that this "John Crane" development has successfully solved the handling of the most difficult corrosive liquids and gases. Where conventional type seals had failed, the Type 9 has done the job. It continues to answer new problems, including temperature conditions from —120°F. up to 500°F.

Designed to withstand practically all chemicals, the Type 9 incorporates a flexible wedge ring and sealing ring molded from DuPont's Teflon. It is engineered for the particular application and can be furnished in the metallurgical specification best suited to the service.



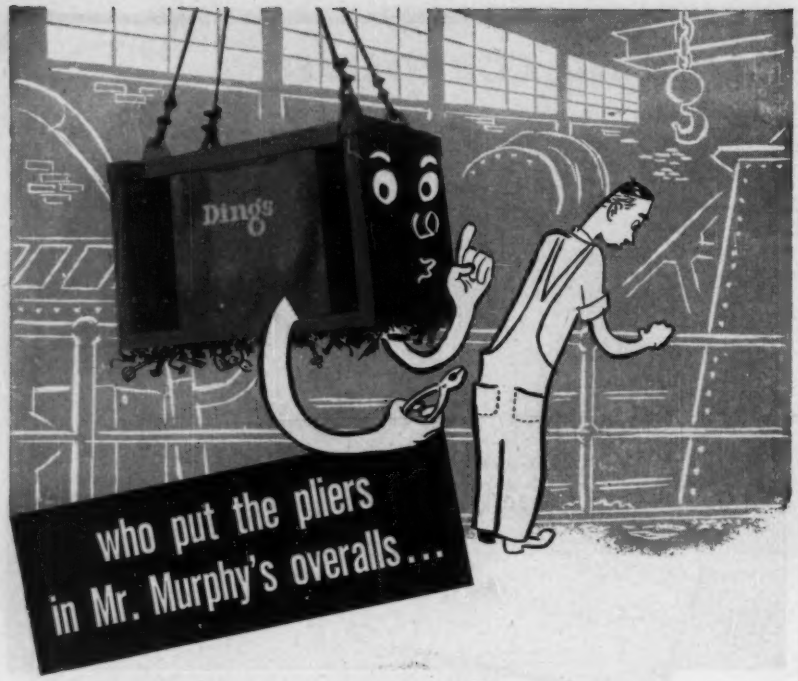
Your toughest problem can be the Type 9's next success story. Use it on all rotating shaft applications, including: centrifugal, rotary pumps, mixers, agitators, autoclaves, other equipment.

Get complete information on the Type 9 Seal from Crane Packing Co., 1809 Belle Plaine Ave., Chicago 13, Ill.

In Canada: *Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont.*

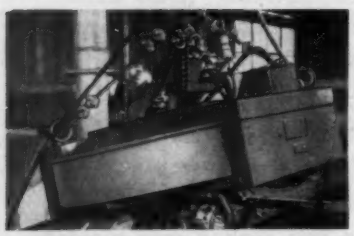
***DuPont trademark*

JOHN CRANE CRANE PACKING COMPANY



MURPHY is what we'll call the chief engineer in the Omaha plant of one of the nation's largest grain processors. Here's his story —

One day, not long after his Dings RM Suspended Tramp Iron Magnet was installed, he was wishing he had a pair of long nosed pliers. Shortly after, one of his men walked up and handed him a pair. They'd been pulled out of a 12-inch conveyor belt burden of corncobs by the Dings RM Magnet.



THIS IS THE MAGNET THAT CAUGHT THE PLIERS — That junk on the bottom is a typical tramp iron accumulation — crushed "tin" cans, wire. "Murphy" reports even crowbars occasionally find their way into the corncobs processed in his plant.

Murphy was awfully glad to see those pliers and not just because he wanted a pair. He was thinking of what they would have done to the hammermills and other processing equipment fed by that conveyor, if they hadn't been caught by the Dings Magnet.

You might think about that, too. What's it costing you to "process" tramp iron in your plant? It isn't necessary. Your Dings representative can show you an economical way to eliminate tramp iron with a Dings Magnetic Separator.

See us at Booth 371
Plant Maintenance Show

Dings

DINGS MAGNETIC SEPARATOR COMPANY
4730 WEST ELECTRIC AVENUE
MILWAUKEE 46, WISCONSIN

MAIL THIS COUPON TODAY

DINGS MAGNETIC SEPARATOR COMPANY RM 154-2/3
4730 West Electric Avenue, Milwaukee 46, Wisconsin
Please send me further information about Dings Magnetic Separators for protection against tramp iron.

Your Name _____ Title _____
Company Name _____
Address _____
City _____ Zone _____ State _____

FIRMS . . .

ElectroData Corp. has established an eastern regional office in New York City.

Dow Chemical Co. has opened a new field sales office in New Orleans.

United Gas Pipe Line Co. has begun full operation of its gasoline and dehydration plant in Cabeza Creek, Texas.

Chas. Pfizer & Co., Inc., will soon complete its new plant for the production of pharmaceuticals, in the Philippines.

Robertshaw-Fulton Controls Co., Grayson Controls Div., now occupies its new factory facilities in Long Beach, Calif.

Monsanto Chemical Co., St. Louis, has begun research activities on rosins at its new paper chemicals laboratory.

Ladish Co. and Clayton Mark & Co. have joined together to offer forged pipe fittings and forged unions from a single source.

Refinaria de Petroleos de Manguinhos, S. A., has opened its new Rio de Janeiro thermal refinery designed by M. W. Kellogg Co.

Westvaco Chlor-Alkali Div. has contracted the Lummus Co. to build a 60 ton/day anhydrous ammonia plant.

Weyerhaeuser Timber Co. plans to construct two plants at Longview, Wash., for the production of chlorine and caustic soda, glassine and grease-proof paper.

Pennsalt Mfg. Co. has opened an agricultural chemical northern div. office at Aurora, Ill.

Miles Laboratories, Inc., Elkhart, Ind., will purchase the Ernst Bischoff Co., Ivoryton, Conn.

Pennsalt Mfg. Co. has opened a new plant in Delaware, Ohio, as a component of the firm's Chemical Specialties Div.

for PUMPING CHEMICAL SOLUTIONS!

K-766

NO LEAKAGE at STUFFING BOX



Fig. 19,488

VERTICAL DESIGN

Taber vertical pumps are specially built for handling chemical solutions, efficiently and economically . . . in the processing industries. Vertical design permits locating stuffing box above and out of liquid level. Therefore nothing to leak.

On business stationery, we suggest you write for:

BULLETIN V-837

TABER PUMP CO. *Est. 1859*
294 ELM ST., BUFFALO 3, N. Y.

You gotta be first...

to be best!*



*25 years ago, Alloy Fabricators started to build Stainless Steel, Monel, Inconel, Nickel and Aluminum Process Equipment. With this experience, naturally, they're your *best bet today!*

It's Still Our Only Business — And We Mind It Well!

ALLOY FABRICATORS

DIVISION OF CONTINENTAL COPPER AND STEEL INDUSTRIES, INC.

PERTH AMBOY, NEW JERSEY



THE FIRST HUNDRED YEARS

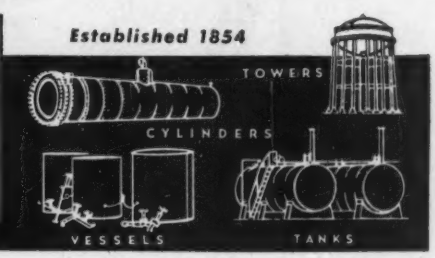
FROM a small iron-works in 1854, we have been fortunate in growing to be one of America's largest metal fabricating industries . . . For the privilege of celebrating our Centennial, we express our appreciation for the friendship of four generations of customers, and the loyalty of four generations of workers.

R.D. COLE

MANUFACTURING CO.

NEWNAN, GA.

Established 1854



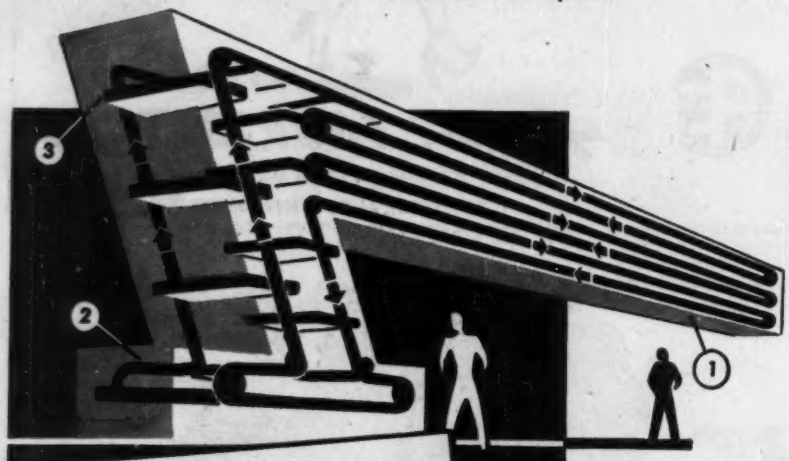


Are your products Cooled, Heated or Dried?

Make new **PROFITS** from unused overhead space while processing your products under exact time, temperature, and atmospheric **CONTROL**

... with a GREER MULTI-TIER

Converts heating, cooling, drying and similar operations from batch to continuous processing. In one application alone, MULTI-TIERS have increased production 5 times per man, in 1/10th the floor space.



① Saves floor space—ample headroom.

② Multi-Tier trays convey products through controlled processing cycles of 10 minutes to 10 hours without jar or jolt. Automatic or manual loading and unloading.

③ Trays always perfectly level —custom fitted to your product.

FREE



New 8-page bulletin tells how a MULTI-TIER can probably save you time, labor and floor space. Send for your copy.

J. W. GREER COMPANY

Wilmington, Massachusetts

GREER

Sales Engineering Offices: New York, N.Y., Chicago, Ill., San Francisco, Calif.

FIRMS . . .

Esso Standard Oil Co. has placed in operation a new Girbotol liquid hydrocarbon purification plant at its Everett, Mass., refinery.

Westinghouse Electric Corp. plans to build a new jet engine research center at a cost of $12½ million, near Kansas City, Mo.

Wallace & Tiernan, Inc., has merged its subsidiary—Maltbie Laboratories, Inc., into the parent company.

Quaker State Oil Refining Corp. has started up two new platforming units near St. Mary's, W. Va., and Emlenton, Pa.

Farrel-Birmingham Co., Inc., has absorbed its subsidiary—Consolidated Machine Tool Corp.—into the parent company.

Humble Oil & Refining Co. will build another new reforming unit at its Baytown refinery at a cost of $3½ million.

Merco Centrifugal Co., San Francisco, has opened a new office in Chicago Hts., Illinois.

Dresser Industries, Inc., will acquire Lane-Wells Co., Los Angeles, by an exchange of 576,000 shares of common stock.

Tracerlab, Inc., has set up a commercial laboratory for supplying radioactive materials to the oil industry.

General Electric Co., Phenolic Products Plant, has installed a complete semi-continuous compounding system to provide a production boost of 60%.

Canadian Liquid Air Co. Ltd. has completed two new plants: at Victoria and at Kitimat as a part of its $500,000 expansion program.

Richfield Oil Corp., Los Angeles, has broken ground for its new $2.5 million research center in Anaheim, Calif.

POWER MEASUREMENT IN LIQUID LOADS



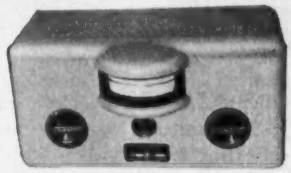
MODEL 3901 THERMOPILE

$75.00 f.o.b. Grass Valley, Calif.

- 30 pair junction moulded in polyethylene
- All Plastic Case
- ¼" copper tube fittings
- Rapid take-down for cleaning
- From 10 watts to several kilowatts per unit

SPECIFICATIONS

Internal resistance	5 ohms
Voltage	1 millivolt per ° C
Maximum pressure	75 PSI
Dimensions	6-3/16 x 2⅛ x 2¾
Weight	15 oz.



MODEL 5800 CALORIMETER

$360.00 f.o.b. Grass Valley, Calif.

- A complete comparator to measured 60 cycle power, utilizing above thermopile.
- Built-in calibration circuit and heater.
- Sensitive, non-clogging flow valve.

SPECIFICATIONS

Weight	Approx. 21 pounds
Dimensions	8¼" x 9" x 17"
Maximum pressure	50 PSI
Range full scale	300, 600, 1500, 3000 watts
Meter sensitivity	1.5 mv
Thermopile sensitivity	1 mv/°C
Controls	Range switch, Calibrating valve, Calibrating potentiometers
Fittings	For ¼" x ⅜" plastic tubing

Other equipment for use in power measurements and specific equipment for microwave power measurement set-up.

- Model 5801 Calorimeter—Range 60, 150, 300, 600 watts.
- Model 3701 Water load calibrator heater.
- Model 4105 X Band Water load • 1000 watts CW 300 Kw. peak • Less than 1.2 VSWR over 7000/10000 mc.
- Model 5500/5501 Variable phase standing wave introducer at X band.

Let us send you full specifications on these tools for power measurement, or send for our complete catalogue.

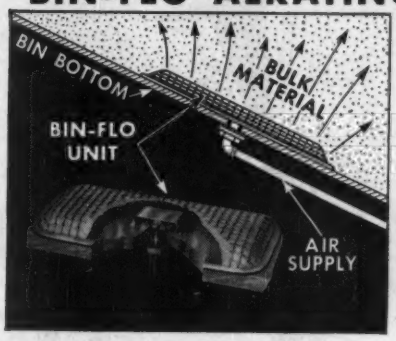
- Glass Working Lathes, equipment.
- High Vacuum Pump and Gauge.
- Hydrogen Bell Jars.
- Vacuum Tube Laboratory Equipment.
- Spot Welder and Timers.

3237

Litton Engineering Laboratories

Grass Valley, California • P. O. Box 949

BIN-FLO AERATING UNIT

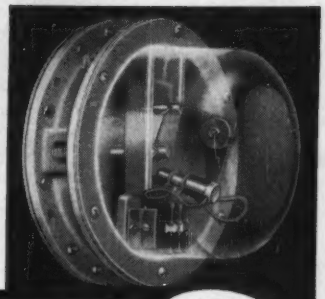


Provides Steady Flow of Dry, Finely Ground Materials which tend to bridge in storage. Uses only small amount low-pressure air.

BIN-DICATOR BIN LEVEL INDICATOR

For All Bulk Materials

signals change in level; automatically starts and stops filling and emptying equipment.

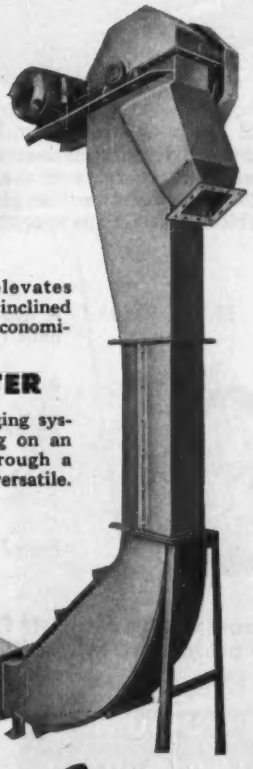


THE BIN-DICATOR CO.

13946-D1 Kercheval • Detroit 15, Mich.

NEW DETAIL DATA BOOK FREE

for bulk MATERIALS HANDLING



One unit feeds, conveys, elevates through horizontal, vertical or inclined planes... quickly, efficiently, economically. It's the...

G-W FLOWMASTER

...a self-loading, self-discharging system of steel flights... moving on an endless all-steel chain... through a dust-tight casing. Unusually versatile. Write today.



GIFFORD-WOOD CO.

HUDSON, N. Y. AND PRINCIPAL CITIES



Furafil 100 is a dark brown lignocellulose flour, 99% of which passes through a 100-mesh screen. For the past three years Furafil 100 has been available in the Northwest where it has achieved success as an extender for plywood glues. Now it also becomes available at modest cost to consumers East of the Rocky Mountains.

IF YOU NEED:

A dependable filler and extender for phenolic resin molding powders and glues,

A filler for rubber compositions,

An anticaking agent, or

A highly absorptive carrier for liquid ingredients being blended with other solids,

Then Furafil 100 will interest you.

QO FURAN CHEMICALS®

The best way to evaluate Furafil 100 in a given application is by actual test. WRITE US for a sample and a copy of our technical bulletin.

The Quaker Oats Company
CHEMICALS DEPT.

335Y The Merchandise Mart, Chicago 54, Illinois
Room 535Y, 120 Wall Street, New York 5, New York
Room 435Y, P. O. Box 4376, Portland 8, Oregon

FIRMS . . .

Bristol Co., Waterbury, Conn., has completed an expansion program including heat treating facilities for the production of instrument parts.

Wolverine Tube, div. of Calumet and Hecla, Inc., has opened a new mill depot in Miami, Fla.

Wallace & Tiernan, Inc., Harchem Div., will now conduct all opertions previously handled by W. C. Hardesty Co., Inc.

Petroleos Mexicanos plans a $40 million expansion and modernization program at the Tampico Pemex installations.

Shell Petroleum Co. Ltd. will soon complete its Cheshire, Eng., plant for the production of epoxy resins.

Standard Oil Co., El Paso, Texas, has awarded a contract for the construction of a 4,500 b/d catalytic reformer to Bechtel Corp.

Franklin Institute Laboratories have established a new research section to study problems inherent in the design of atomic plants.

Naph-Sol Refining Co., Muskegon, Mich., has put a 1,000 b/d UOP platforming unit on stream to make 95 leaded octane platformate.

The Swartwout Co., manufacturer of process control equipment, has separated the Autronic sales operations from its other divisions.

Furane Plastics Inc. has taken over the epoxy tooling activities of Wal-Mar Plastics, Inc.

Continental Can. Co. has purchased the Wallace Container Corp., of Santa Ana, Calif., manufacturers of Vynite collapsible tubing.

Crown Central Petroleum Corp. put its new houdriformer on stream at its Houston refinery.

PIPE COILS? here's something better



COST LESS
PERFORM BETTER

THERMO-PANELS®

An Improvement on Pipe Coils

Yes, you save space and heat or cool more efficiently . . . for these scientifically designed units for which performance can be accurately anticipated, are an economical replacement for pipe coils. For use in the heating and cooling of liquids, slurries, soaps, waxes, acids, alkalies, electrolytes, powders, and mixtures.

Available in special shapes such as "U's", "L's" and cylinders . . . and in a wide range of materials, including iron, stainless steel, monel and other special alloys.

Send for FREE bulletin.



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DIVISION
DEAN PRODUCTS, INC., 616 Franklin Ave., Brooklyn 38, N.Y. STerling 9-5400

COLTON ROTARY PRESSES

CAPACITIES 65 TO OVER **5000** TABLETS PER MINUTE

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AT

LOW COST

ARTHUR **COLTON** COMPANY
Established 1887
Div. Snyder Tool & Engineering Company
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AN EXPLANATION

In answer to increased interest in a recently inaugurated procedure for conducting "on-the-spot" demonstrations of air-flotation equipment, we are pleased to make the following explanation.

The advent of our lab-size Whippet V-80 Separator makes it possible to establish, in your own plant and at your convenience, accurate forecasts of results which will be obtained from the identical process under full-scale operating conditions.

Such a demonstration may be of invaluable aid to that phase of your research program which involves the economy of operations and the quality of raw or end products. Perhaps the V-80 will indicate an immediate usefulness. Seeing is believing.

Your move is simple. Write to the department and address below. Tell us that you want to see the results of separations made by effecting differences in specific gravity through air-flotation . . . under *your* actual operating conditions, rather than in a catalog. We'll take it from there.



DEPT. C-155
SUTTON, STEELE & STEELE, INC.
1031 SOUTH HASKELL, DALLAS, TEXAS

Even More Surface

per sq. ft. of face area

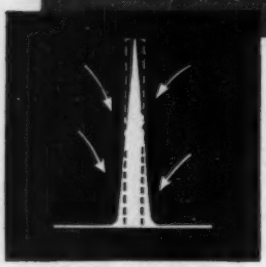
Even Less

Air Friction



with the New AEROFIN Type B

Smooth-Fin Heat Exchangers



Tapered Fin

The new smooth fin is tapered, with a wide contact base which conducts sufficient heat to make the entire fin effective transfer surface. It is no longer necessary to crimp the fin to provide the required contact area.

By eliminating the air resistance and turbulence caused by the fin corrugations in the old-type coils, it is now possible to use almost twice as many fins per inch with no increase in air friction.

The resulting increase in capacity is obvious. As a consequence, these new coils offer:

Greater capacity per square foot of face area

Lower airway resistance – less power needed to deliver the required C. F. M.

Smaller face area, due to the practical use of higher air velocities

Fewer rows of tubes for a given B.T.U. transfer in a given area

Less weight – easier handling

Better drainage of condensation from water coils; improved venting and drainage for heating coils

Compact, sturdy design

Standardized encased units arranged for quick, economical installation

Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION SYRACUSE 1, N.Y.

FIRMS . . .

Delhi Oil Corp. and the **Taylor Oil & Gas Co.** have merged.

Beckman Instruments, Inc., Fullerton, Calif., has completed the acquisition of Specialized Instruments Corp. and Spinco Service Co.

General Electric Co. has established a Materials & Processes Lab in Syracuse, N. Y.

Standard-Vacuum Oil Co. plans to spend $70 million or more during the next four years to expand its Indonesian oil facilities.

Emsco Mfg. Co., Los Angeles, will acquire most of the assets of the Johnston Pump Co.

New Companies

Sybeltra—a new Belgian industrial syndicate formed to bid in foreign tenders for the setting up of chemical factories.

Screw Conveyor Pacific Corp., Santa Clara, Calif.—has been activated by the Hammond, Ind., parent company: Screw Conveyor Corp.

New Lines

M & M Wood Working Co., Nat'l Tank & Pipe div., will enter the plastic pipe business this month.

New Names

Midwestern Instruments is the new name for the Midwestern Geophysical Laboratories, Tulsa, Okla.

Comco, Inc., is the new name given to Conn. Metalcraft, Inc.—a division of Enthone, Inc.

Air Polution Foundation is the new name of the So. California Air Pollution Foundation.

Daubert Chemical Co. is the new corporate name of the Nox-Rust Chemical Corp., Chicago, to emphasize its diversified products.

EXACT WEIGHT Sacking Scales

. . . sack, weigh, and check . . . in ONE operation



One simple operation does the work of three! One man can bag, weigh, and check as much as 100 tons of free-flowing materials per day from overhead hopper to foot-level conveyor. The saving in labor costs, together with the saving from elimination of over-weights, can pay for the installation. Simple to operate, has just two controls. It takes just four easy motions to attach a bag, fill it, and release to conveyor. Model 2229, shown, is designed for ceiling suspension. Others feature post, pedestal, and dolly mountings. Write for details.



Exact Weight Scales

Better quality control

Better cost control

THE EXACT WEIGHT SCALE COMPANY

901 W. Fifth Avenue, Columbus 8, Ohio
In Canada: P.O. Box 179, Station S, Toronto 18, Ont.

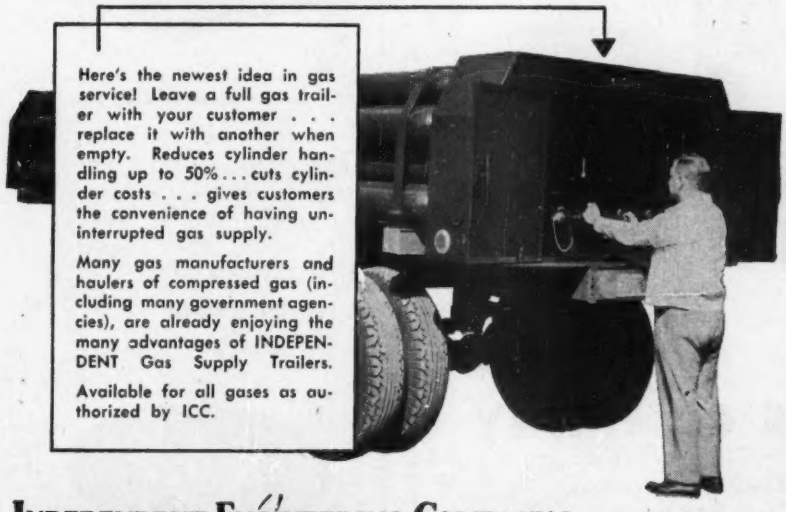
REDUCE CYLINDER HANDLING

Up to 50% with INDEPENDENT Gas Supply Trailers!

Here's the newest idea in gas service! Leave a full gas trailer with your customer . . . replace it with another when empty. Reduces cylinder handling up to 50% . . . cuts cylinder costs . . . gives customers the convenience of having uninterrupted gas supply.

Many gas manufacturers and haulers of compressed gas (including many government agencies), are already enjoying the many advantages of INDEPENDENT Gas Supply Trailers.

Available for all gases as authorized by ICC.



INDEPENDENT ENGINEERING COMPANY, Inc.

Manufacturers of

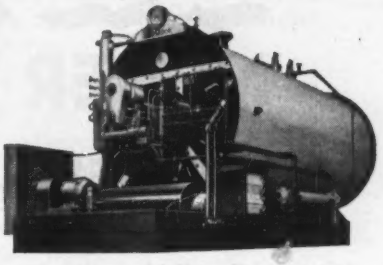
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HOW SUPERIOR SOLVES YOUR STEAM PROBLEMS



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Completely factory-assembled and tested, a Superior Steam Generator is backed by undivided responsibility.

INDUCED DRAFT THAT'S BUILT-IN

. . . eliminates need of an expensive chimney . . . Multiple fans draw evenly on all tubes, reducing maintenance.

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High gas velocities produce high efficiency. Down-draft design promotes rapid evaporation, quicker steaming.

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A minimum of 5 sq. ft. of heating surface per boiler horsepower assures maximum efficiency at full rated capacity.

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All controls essential to completely automatic operation are factory-wired into an easily accessible control panel.

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Superior Burners burn oil or gas or a combination of both . . . changing from one fuel to the other in seconds.

18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 622-F. Water Tube types up to 40,000 lbs./hour write for Catalog 622-W.

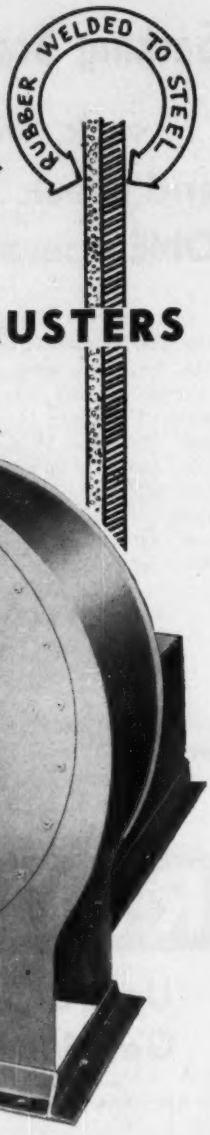
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SUPERIOR STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

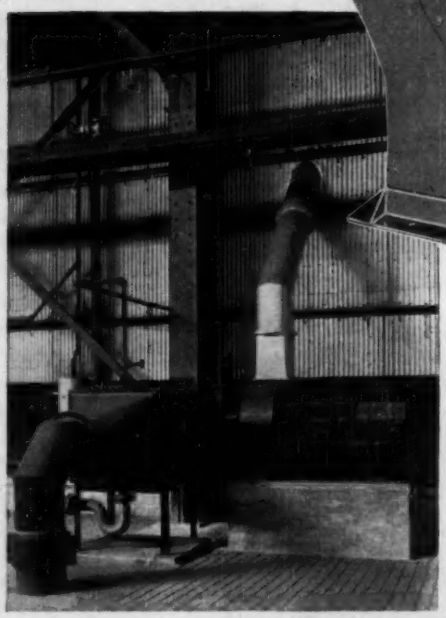
FAN-EATING FUMES NEVER TOUCH METAL

IN "BUFFALO" RUBBER-LINED EXHAUSTERS



It's not a "new" idea — "Buffalo" Rubber-Lined Exhausters have been saving money on corrosive fume jobs for over twenty-five years — lasting anywhere from three to twelve times longer on the job than ordinary steel plate exhausters. And it stands to reason — for fumes passing thru these fans contact nothing but rubber, vulcanized to every square inch of the wheel, hub and housing. Savings in fan replacements more than pay for the additional cost of the rubber lining, to say nothing of the reduction in shutdown time. "Buffalo" fans are also available with other coatings and of special metals to resist corrosion. This is just another example of the "Buffalo" "Q" Factor* that saves you money and troubles with every "Buffalo" Fan you buy.

Diagram shows how interior surface of fan is covered with layer of rubber vulcanized to the steel.



"Buffalo" Rubber-Lined Fan and Gas Scrubber in a steel mill.

**The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.*

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"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

Lapp Valves are Solid Porcelain

You need to make no compromise with contamination or corrosion from valves in chemical processing. Lapp valves are of *solid* Lapp Porcelain, a material unique as a ceramic for industrial scale chemical service. It alone offers the following combination of characteristics and qualities:

PURITY • Lapp Porcelain is a potassium aluminum silicate, made from selected clays, flint and feldspar...has no free iron or other metallic impurity.

NON-POROUS • Complete vitrification of all sections, through firing to 2300°F., provides *zero* porosity. No dye penetration of body in 100,000 psi test. No chemical can penetrate in service.

HIGH MECHANICAL STRENGTH

Compression strength ..... 100,000 lbs. per sq. in.
Tensile strength ..... 8,000 lbs. per sq. in.
Modulus of rupture ..... 15,000 lbs. per sq. in.

CHEMICAL RESISTANCE • Lapp Porcelain is unaffected by any acids except HF. It provides years of trouble-free service, handling hot acids in all concentrations, as well as mixed acids and other troublesome combinations.

UNIFORM QUALITY • Lapp Porcelain has been manufactured for 38 years for use in most severe chemical, electrical and mechanical services. Plant facilities include Lapp-patented vacuum processing, deaerating pug mills, two continuous tunnel kilns, and complete chemical, electrical and mechanical test equipment.

Write for bulletin with complete description, characteristics, and specifications. Lapp Insulator Co., Inc., Process Equipment Division, 312 Wendell St., LeRoy, N. Y.



An electrical test is the most searching inspection for physical soundness! Porcelain bodies for Lapp valves above are being flashed over—at 70,000 volts for three minutes. Any physical defect is revealed as an electrical puncture.

Y-valves, angle valves, flush valves, safety valves, and plug cocks of Lapp Porcelain have standard bolt-circle flanges for easy connection to all piping and equipment.

Lapp

PROCESS EQUIPMENT

Chemical Porcelain Valves • Pipe • Raschig Rings
Pulsafeeder Chemical Proportioning Pumps



It's the Nash!

The ability of Nash Compressors to maintain original performance over long periods is no accident. Nash Compressors have but a single moving element, the Nash Rotor. This rotor is precision balanced for long bearing life, and it revolves in the pump casing without metallic contact. Internal lubrication, frequent cause of gas contamination, is not employed in a Nash. Yet, these simple pumps maintains 75 lbs. pressure in a single stage, and afford capacities to 6 million cu. ft. per day in a single compact structure.

Nash Compressors have no valves, gears, pistons, sliding vanes or other enemies of long life. Compression is secured by an entirely different principle of operation, which offers important advantages often the answer to gas handling problems difficult with ordinary equipment.

Nash Compressors are compact and save space. They run without vibration, and compression is without pulsation. Because there are no internal wearing parts, maintenance is low. Service is assured by a nation-wide network of Engineering Service offices. Write for bulletins now.

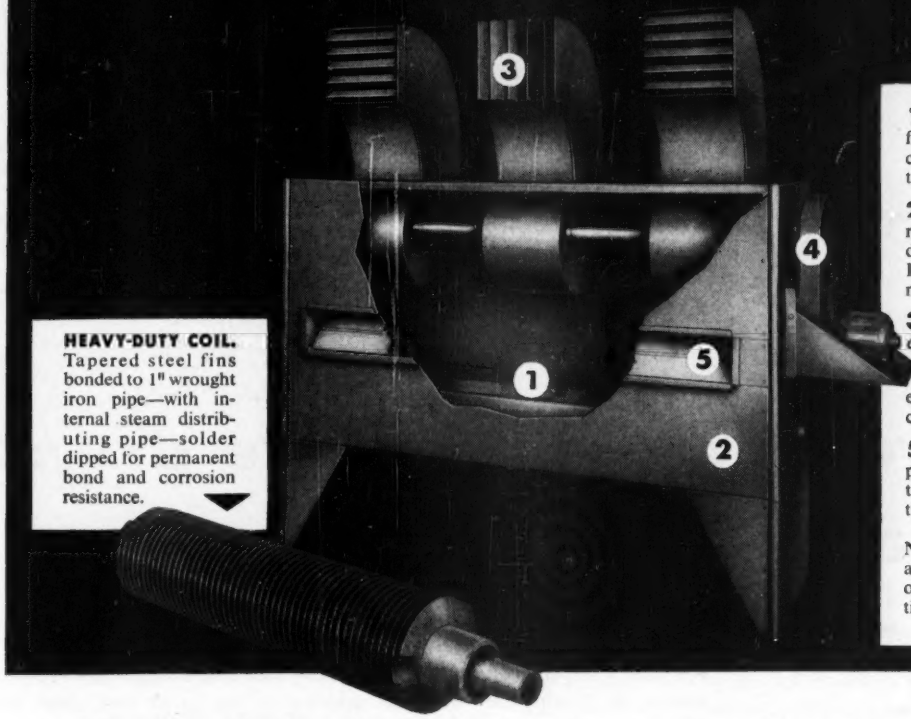
- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature Automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY

312 WILSON, SO. NORWALK, CONN.

Fact:

Rugged Westinghouse Industrial Heaters available in 24 Sizes . . . 8 Coil Selections . . . 150 Ratings from 100,000 to 2,500,000 BTU/hr . . . 2,000 to 25,000 CFM each



HEAVY-DUTY COIL. Tapered steel fins bonded to 1" wrought iron pipe—with internal steam distributing pipe—solder dipped for permanent bond and corrosion resistance.

1. Proven, Westinghouse-manufactured, extended surface heating coils good for continuous operation up to 200 psig.

2. Die-formed casings with rounded corners eliminate accidents and dirt catching pockets. Front and back panels easily removable.

3. Multiple louvered outlets for efficient distribution of heated air.

4. Self-aligning, grease-lubricated ball bearings mounted outside casing, readily serviceable.

5. Face and by-pass dampers permit continuous air circulation to maintain uniform temperatures.

NOTE: Louver type mixing box accessory permits introduction of fresh air for make-up and ventilation, with or without filters.

Solve your space heating problems with Westinghouse-Sturtevant Industrial Heaters. Eliminate cold, drafty conditions caused by excessive cold infiltration through leakage or exhaust.

Two Types With Wide Applications:

GENERAL PURPOSE HEATER . . . For manufacturing areas, warehouses, garages, commercial buildings—with standard non-ferrous heating coils.

HEAVY-DUTY HEATER . . . For continuous-duty high-pressure systems, or industrial process work—with wrought iron heating coils.

The compact packaged engineering of every Westinghouse-Sturtevant Industrial Heater provides units for mounting on floor, walls, or suspended from ceilings. In short, they can be placed where they will do the most good, and can be relocated to meet any change in plant layout.

Every unit is backed with a Westinghouse exclusive—*one warranty*. Only Westinghouse makes all principal components—Fans, Heating Coils, and Motors. You can get unit engineering and single equipment responsibility.

MORE FACTS? To find out how to solve your particular heating problem, call your Westinghouse-Sturtevant Sales Engineer . . . he is the "Man With The Facts" on heating, air handling, and electronic air cleaning . . . or fill in coupon below.

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YOU CAN BE SURE...IF IT'S **Westinghouse**

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Westinghouse Electric Corp.
Sturtevant Division, Dept. 15B
Hyde Park, Boston 36, Mass.

Please send more information on your Industrial Heaters.

NAME AND TITLE .....

COMPANY .....

CITY .....STATE.....

Can you name these states?



There are Continental fibre drum plants in all of them



ANSWERS: **1. New York 2. Pennsylvania 3. Ohio 4. Missouri 5. California**

No other company offers you the cross-continent, on-the-spot fibre drum service of Continental. With the opening of our giant new plant in Pittsburg, California, there are Continental manufacturing facilities within easy shipping distance, wherever you do business in the United States.

This easy availability is only part of the Continental service story. When you choose tough, lightweight Leverpak, Stapak, or Fiberpak drums, you have your choice of many sizes, 17 colors, any of 14 inks. Made-to-order linings are available to give your product extra protection. Continental's packaging engineers and research teams stand ready to help you test your shipping methods and to help solve your packaging problems.

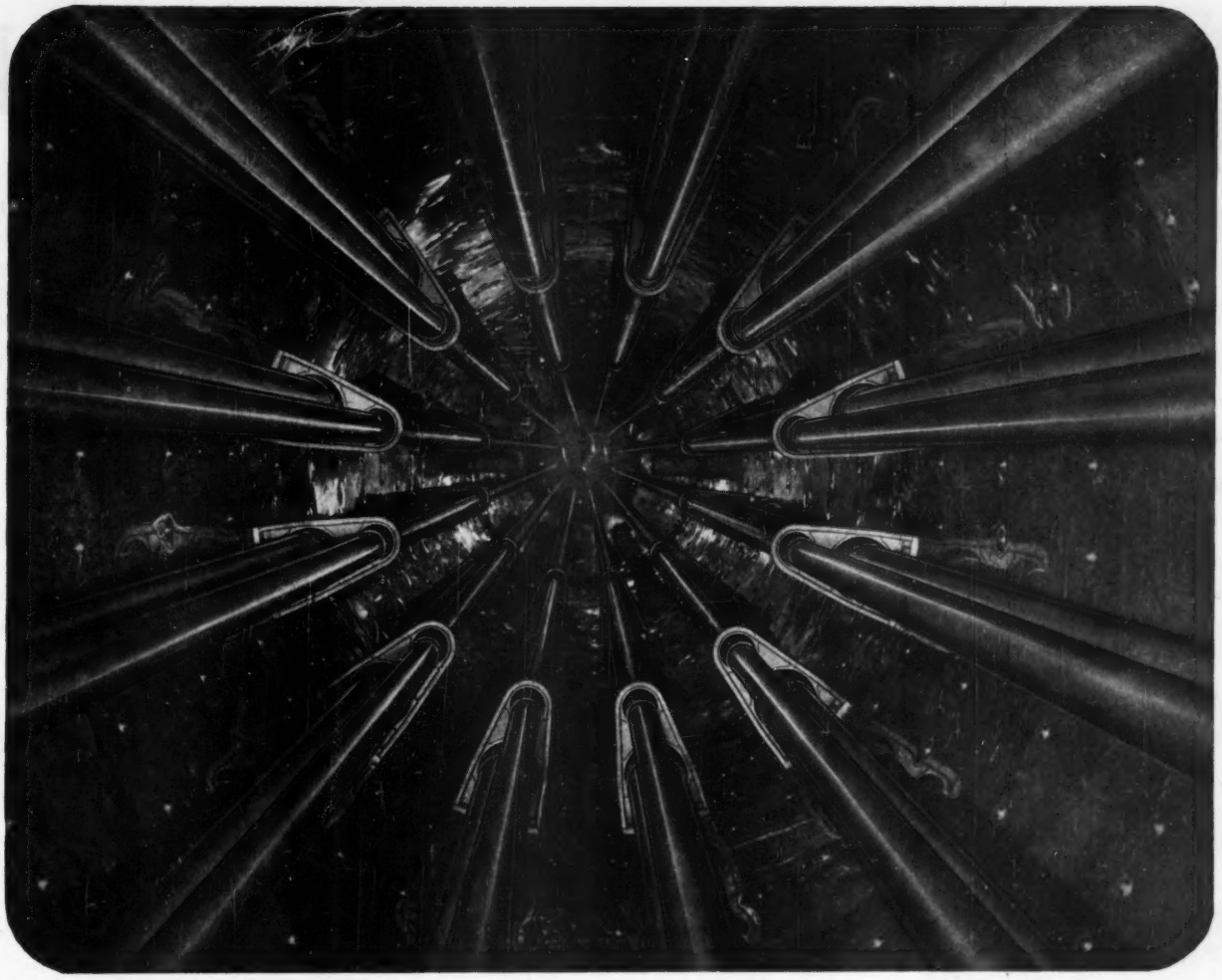
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TRENTWELD STAINLESS TUBING gives longer operating life...

TRENTWELD stainless steel tubing gives economical, trouble-free service over long periods of use. It's an ideal choice, for example, for applications such as the 60-foot rotary kiln dryer you are looking into in the photograph above . . . operating at high temperatures and where corrosive conditions are encountered.

In fact, you just can't buy better tubing than TRENTWELD for any application. That's because TRENTWELD stainless and high-alloy *welded* tubing is a product of tube mill specialists. Each tube has a uniformly sound weld indistinguishable from the parent metal and just as strong and corrosion-resistant.

Whether or not your job is as large and complex as a rotary dryer, you can specify TRENTWELD tubing with confidence. And when it comes to tubing sizes and finishes, Trent offers the widest range in the industry . . . from ⅛" to 40" O.D. and up. Next time you have a job involving tubing, remember—you can make it better with TRENTWELD.



FREE—Write for your copy of the new TRENTWELD price calculator. Just a tug at the selector slide gives you complete price information and weight per foot of the tubing size and grade you need. Better send for your free copy now.

TRENTWELD

STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

Teaching an Old Chemical



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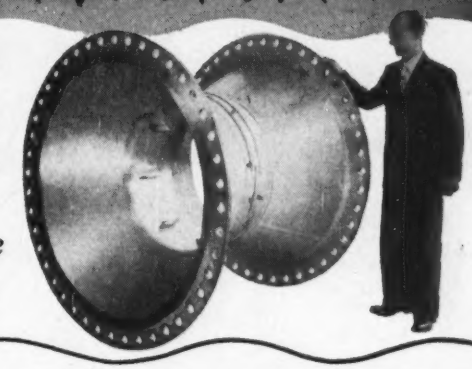
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FOR *FLOW MEASUREMENT*

only the Gentile FLOW TUBE manufactured by FOSTER offers you all these* **ADVANTAGES:**

*Gen-til-'ly



ACCURACY — Produces differential from points of equal cross-sectional area . . . furnished with head capacity curves, and guaranteed for exceptional accuracy when used with any standard indicating, recording or integrating meter.

LOW HEAD LOSS — Available in several types and D/d ratios to provide differentials that can be accurately measured with least head loss.

LOW INSTALLED COST — Average length is only 1½ times the pipe diameter, and straight runs entering and following are not required unless installed near throttling valves or regulators.

Write for Bulletin FT-101 or specific recommendations

75 YEARS OF EXPERIENCE

FOSTER ENGINEERING COMPANY

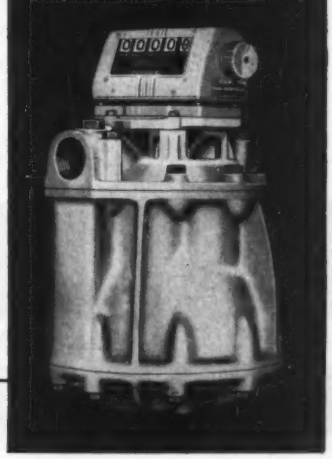
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AUTOMATIC VALVES • SAFETY VALVES • FLOW TUBES

IF YOUR AUTOMATION PROGRAM INCLUDES LIQUID MEASURING...

Start with a BOWSER ESTABLISHED 1885

XACTO METER



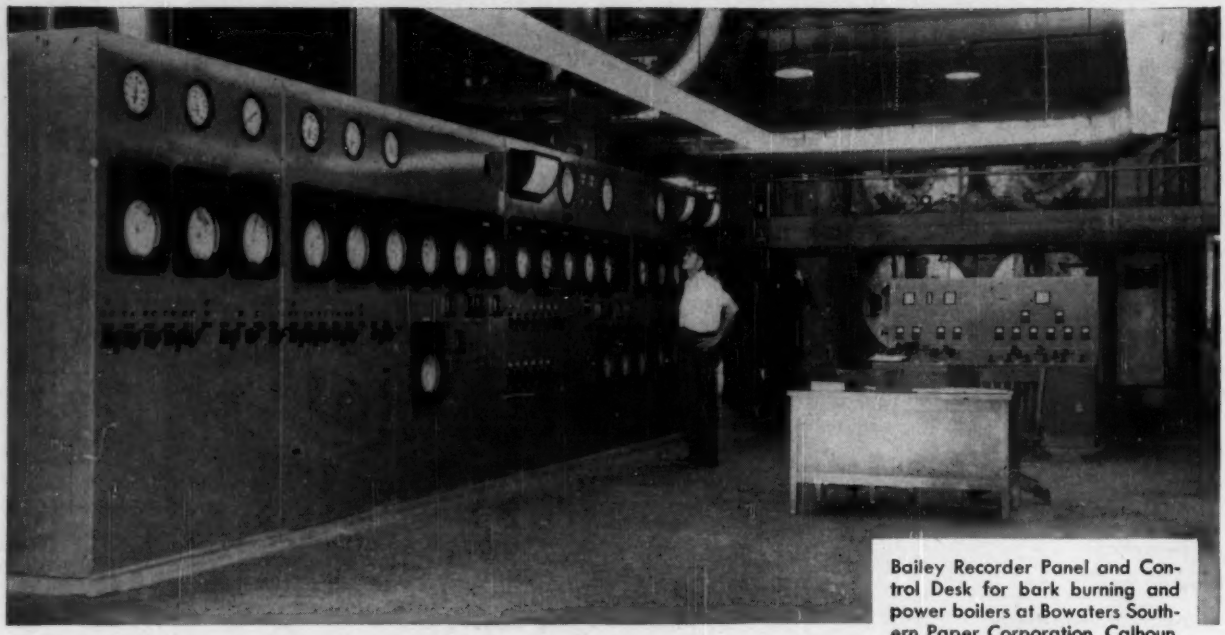
Chemical processors have learned that the Bowser XACTO meters have proved to be the answer to product uniformity, increased production and reductions in operating costs.

XACTO meters are accurate and dependable . . . will safely handle over 856 different liquids in processing, blending, packaging and many other batching or blending operations.

Consult with the Bowser man in your area —no obligation, of course! Or write **TODAY** for complete XACTO data.

BOWSER, INC.
1375 Creighton Ave., Ft. Wayne 2, Ind.

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Bailey Recorder Panel and Control Desk for bark burning and power boilers at Bowaters Southern Paper Corporation, Calhoun, Tennessee.

Bailey at Bowaters

Bailey Meters and Controls help Bowaters Southern Paper Corp. to secure optimum performance from Power, Bark Burning, and Recovery Units.

■ Bowaters have insured a full return from their investment in steam generating, bark burning, and recovery equipment by the use of Bailey Instruments and Automatic Controls.

This equipment includes Distribution Meters, Three-element Feed Water Control, Combustion Control, Feed Pump Control, Safety Interlocks, Pressure-reducing and Desuperheating Controls. It helps operators to deliver uninterrupted service with top fuel economy and full operating safety.

When you call Bailey in on your metering and control problems you get the following advantages:

1. Equipment recommendations from a complete line of well-engineered and carefully tested products.
2. Seasoned engineering experience based on thousands of successful installations.
3. A Bailey District Office or Resident Engineer in or close to your industrial community.

Ask the Bailey Engineer in your community to arrange a visit to a nearby Bailey Installation. We're glad to stand on our record. A-126-1

BAILEY METER COMPANY

1054 IVANHOE ROAD • CLEVELAND 10, OHIO

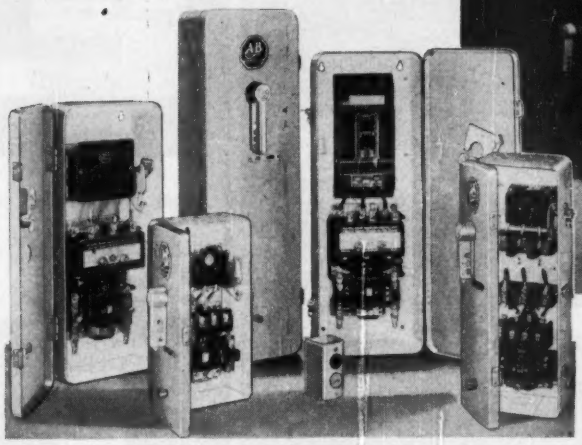
INSTRUMENTS AND CONTROLS

For Power And Process

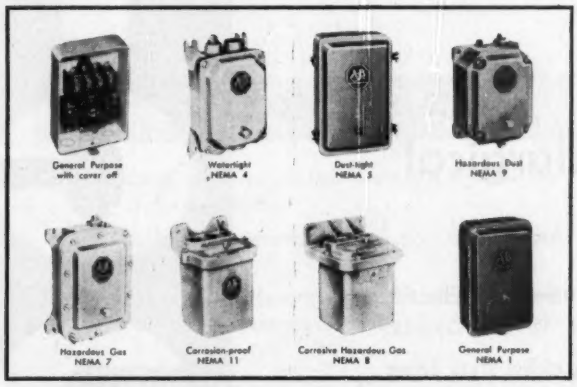


The Sign of
QUALITY
MOTOR CONTROL

Simple design—Quality workmanship—Maintenance free contacts—Long life.



Bulletin 712 starters use manual disconnect, either fused or unfused.
Bulletin 713 starters use instantaneous trip circuit breakers.



Motor Control Enclosures **for Every Application**—Above is shown the many types of enclosures available for the plain Allen-Bradley starters. Most of these types can also be supplied for combination starters. All starters have double break, silver alloy contacts that need no cleaning, filing, or dressing . . . a maintenance free feature that is a decided advantage for starters with bolted enclosures.

COMBINATION STARTERS
make Neater and Safer Installations

If, in your plant, the Electrical Code requires a manual disconnect switch ahead of each magnetic starter . . . be smart . . . use Allen-Bradley Bulletin 712-713 combination starters. They are extra safe, because they cannot be opened unless the disconnect lever is in the OFF position. They save wiring expense, too, and make a compact, neat installation.

The above installation of Bulletin 712 combination starters in NEMA Type 4 waterproof enclosures, with watertight START-STOP buttons and pilot lights, is in a Peruvian salt refinery.

Bulletin 713 combination starters could have been used with a circuit breaker in place of the disconnect switch. The price is somewhat higher.

Available up to 300 hp, 220 v; 600 hp, 440-550 v. Send for Bulletin 712-713.

Allen-Bradley Co., 1337 S. First St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

THIS PLANT IS MAKING Metallurgical History



Designed and Constructed by Chemical Construction (Inter-American) Ltd.

Pure Nickel by Chemical-Metallurgical Processes

Production is underway at this new nickel refinery of Sherritt Gordon Mines Limited, Fort Saskatchewan, Alberta, Canada.

This plant combines a process for leaching nickel from Lynn Lake concentrates by using ammonia and air, and a process for precipitating the pure metal from ammoniacal solutions by using hydrogen under pressure.

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CC281

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Condenser Tubes For Good Corrosion Resistance



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Excellent corrosion resistance to corrosive or contaminated sea water.

Resists impingement corrosion at higher velocities.

Unaffected by chlorination sufficient to combat biofouling.

Highly resistant to steam and steam condensate.

TO FRESH WATER

Excellent corrosive resistance to a wide variety of fresh waters.

Superior resistance to pollution from paper mill wastes.

Gives long life under conditions too severe for ordinary condenser tube alloys.

To strike a sound balance between first cost of condenser tubes, and long-range operating efficiency and maintenance costs, it's good economics to consider Bridgeport Duronze IV (Arsenical Aluminum Bronze). These condenser tubes give long service life and reduce shutdown time.

Bridgeport Duronze IV is just one of the many Bridgeport condenser tube alloys made to ASTM Standards and to meet every type of operating requirement. Bridgeport's Corrosion Laboratory will be glad to work with you in selecting the alloy best suited to your own operating conditions.



Write for Bridgeport Condenser and Heat Exchanger Tube Handbook —which contains much useful information on condenser tubes and corrosion problems.

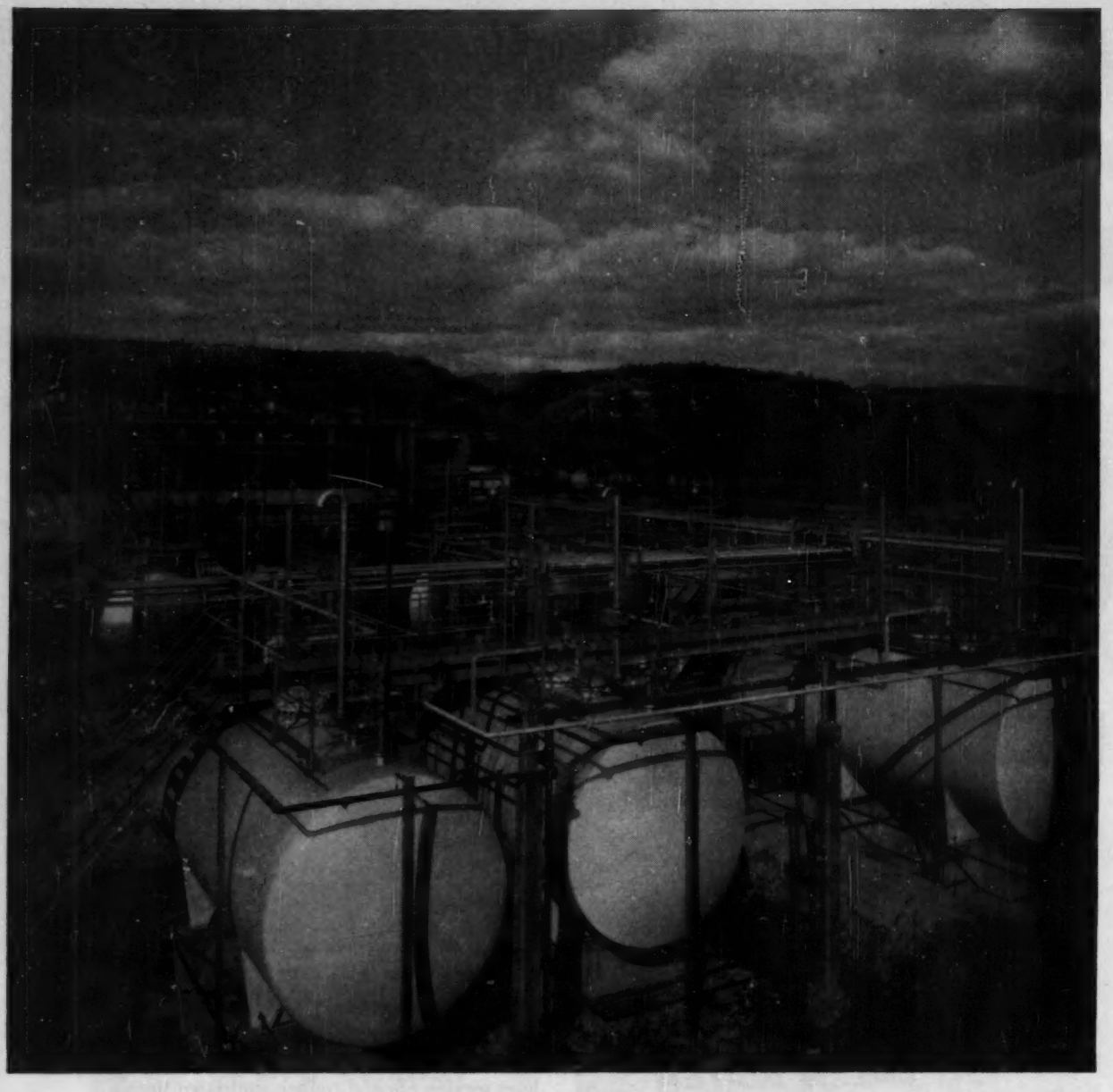
BRIDGEPORT BRASS

COMPANY ♦ BRIDGEPORT, CONNECTICUT

Sales Offices in Principal Cities—Conveniently Located Warehouses

Mills at Bridgeport, Conn., Indianapolis, Ind., and Adrian, Mich.

In Canada: Noranda Copper and Brass Limited, Montreal



For any kind of chemical construction . . .

you can count on KOPPERS!

In the chemical industry, only in rare instances do the results of research justify the immediate construction of a full-scale chemical plant. Therefore, Koppers builds development plants as well as large chemical plants.

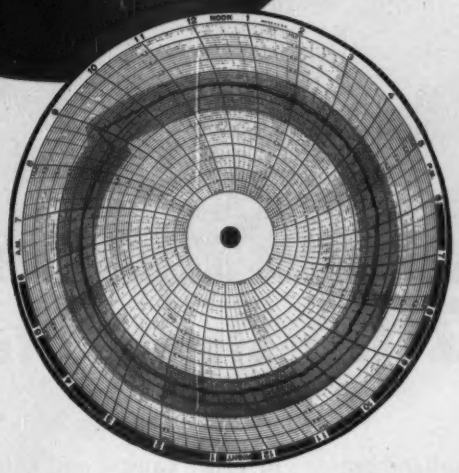
A case in point is this development plant at Kobuta, Pennsylvania — designed and constructed by our engineering staff. Here, experimental plastics developed by research are adapted to commercial use, and are produced in semi-commercial quantities for sampling and use by customers. This plant is designed in such a way that it can be expanded as the need arises.

Our Engineering and Construction Division can handle your smallest or largest construction jobs. Whether you are interested in producing test-tube or tank-car quantities of chemicals, just call on Koppers. Your inquiry is invited.

KOPPERS®

KOPPERS COMPANY, INC.
Engineering and Construction Division
Chemical Department
Pittsburgh 19, Pennsylvania

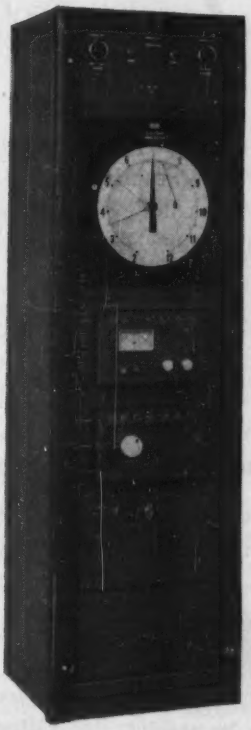
BECKMAN pH



IMPROVED QUALITY AND UNIFORMITY Continuous pH control eliminates grab-sampling uncertainties. Its unwearying alertness provides unvarying aqueous fluid processing.

PROCESS MATERIAL SAVINGS Beckman automatic pH control supplies *exactly* the right amount of reagent or process material for optimum results. Resulting savings in chemical costs quickly pay for the installation.

MAN-HOUR SAVINGS Skilled technologists can devote their time to more exacting tasks with Beckman pH control on the job.



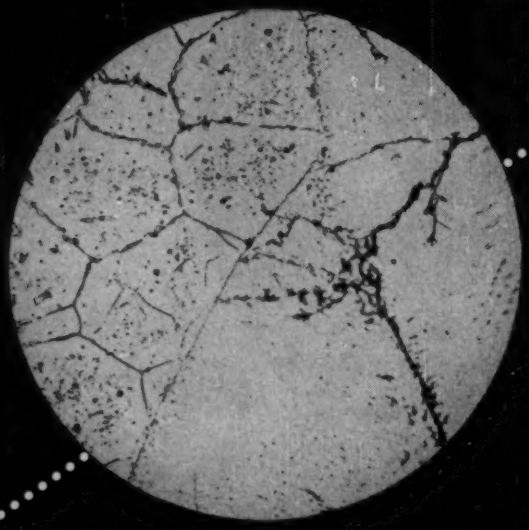
and now-packaged pH control. An entire system custom built at the Beckman factory...wired, piped and assembled ready for simple plug-in installation. Designed for use in any pH process application, these dependable systems combine in a single package all the components needed for single- or multiple-channel pH process monitoring, recording and controlling. On-the-spot analysis of your requirements as well as installation supervision and personnel training.

For complete information write for Data File 54–14

Beckman *division*

BECKMAN INSTRUMENTS, INC.
FULLERTON 1, CALIFORNIA

Here's a better solution to a tough Corrosion Problem



Carpenter 7Mo Stainless Tubing & Pipe

The corrosion-inviting cracks in the right-hand section of the photomicrograph above end abruptly as they near the center of the picture... and that quick ending may help you find a quick ending to stress corrosion cracking problems.

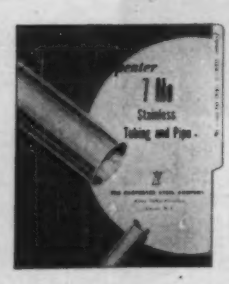
The picture is Carpenter 7Mo stainless pipe (left) welded to a Type 316 fitting. It is still unaffected by the stress corrosion cracking that has destroyed the usefulness of the fitting. The pipe outlasted three such fittings before the photomicrograph was made.

The stout resistance of Carpenter 7Mo to stress corrosion cracking, even in the presence of chlorides or other caustic and sulphite solutions, is coupled with excellent resistance to general corrosion and pitting. It has been used as a "problem solver" in food and chemical processing plants, pulp mills, petroleum refineries and other places. There may be a profitable place for it in your operation. We'll be glad to work with you, aid you in investigation of your problems and a possible 7Mo solution.

MEMBER

The Carpenter Steel Company, Alloy Tube Division, Union, N. J.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"



Write for your copy of the Carpenter 7Mo Technical Bulletin containing comprehensive data.

Carpenter

Stainless Tubing & Pipe

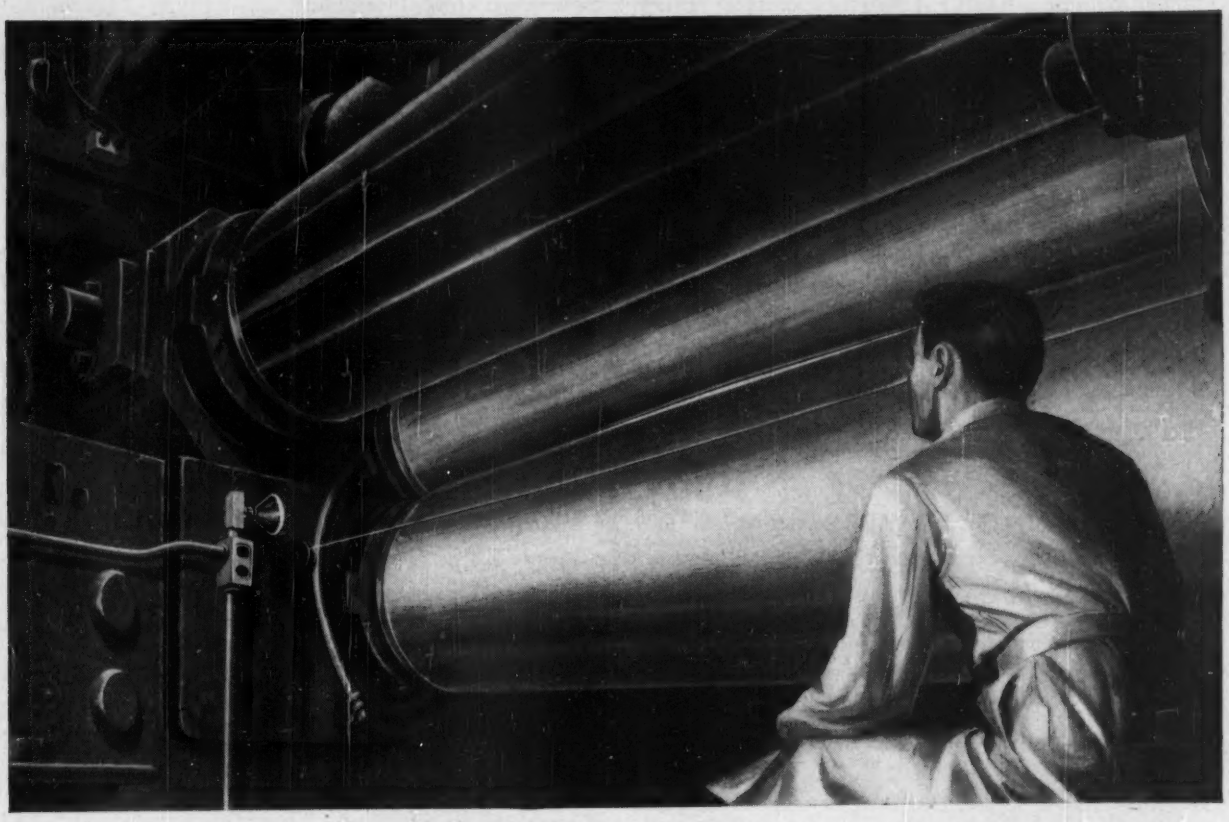
EXON: each resin engineered for a specific problem



EXON 905-915-925

created specifically for

processability



Temperature-tailored to be exceptionally versatile . . . Exon 905, 915, 925 are P.V.C. resins created by Firestone to solve many production headaches.

No matter *how much* operating temperatures have previously limited your processing facilities, these EXON resins can be used individually or easily blended so that heat problems never hinder your ingenuity or product progress.

Several unique advantages are provided by the Exon 900 series resins.

- **Extremely rapid blending—hot or cold.**
- **Shorter fusing time—for fast, more economical operations.**
- **Freedom from fisheyes—assuring higher quality, greater product uniformity.**

These Exon 900 resins adapt readily to your present operating conditions, creating new horizons for your equipment.

For complete information or technical service on the ever-growing line of EXON resins, call or write:

Firestone

EXON

FIRESTONE CHEMICAL SALES DIVISION
FIRESTONE PLASTICS COMPANY, POTTSTOWN, PA., DEPT. 28L
DIVISION OF FIRESTONE TIRE & RUBBER CO.

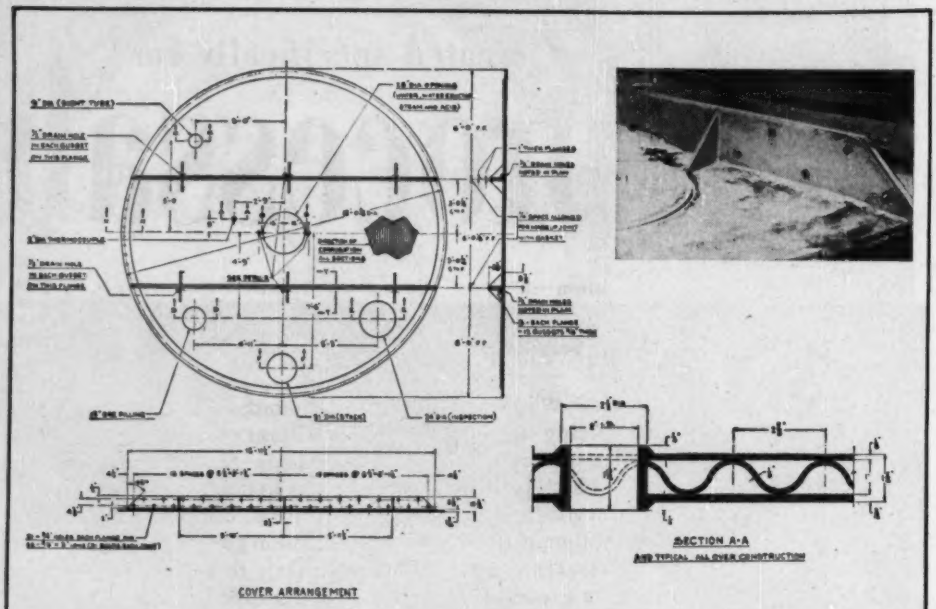
consult HAVEG . . . America's first molder of corrosion-resistant plastic equipment



P-G TANKS for metal finishing withstand acid attack, are non-conductors of electricity, can take hard knocks.



P-G FUME DUCT is molded into complete fume removal systems. Duct is easily installed, does not require elaborate supports.



HAVEG BUILT THIS P-G COVER FOR AN ACID STORAGE TANK. It replaced a wooden one with a service life of less than a year. A special corrugated reinforcement (see Section A-A) also of P-G, increased the cover's strength, reduced the weight. From design to installation, Haveg engineers worked closely with the plant engineers, made sure by return inspection that true value had been received. In fact, the customer recently ordered another P-G cover for an adjacent tank in the same service.

FOR COOLING TOWERS • FUME DUCT • TANKS • COVERS • LININGS • PIPE

of P-G laminated polyester glass

Both users and manufacturers of cooling towers, and similar structures subject to corrosive liquids and gases, can profit by relying on the accumulated engineering skill of the Haveg Corporation, which is now making polyester glass laminated plastic equipment.

Polyester glass is lightweight, low-cost, easy to fabricate and install. It resists many corrosives. Haveg P-G (polyester-glass) products are satisfactory for continuous operation at temperatures about 200°F., and for intermittent service as high as 240°F.

Molding plastics into corrosion-resistant equipment is not a new venture for Haveg. Over twenty years ago Haveg introduced a new plastic material . . . Haveg . . . made from acid-digested asbestos mixed with special Haveg resins. Haveg has been made into the biggest molded plastic tanks in the world, into a 200′ high fume stack, into giant petrochemical installations.

Like any other construction material, Haveg 41 and 60 and the new P-G materials sometimes present problems in design, manufacture, installation, or economics of selection. In the end, the purchaser must rely on the experience and reputation of the supplier. So Haveg makes these promises:

1. Polyester glass will be recommended and supplied only after complete testing and full consultation with your plant engineers.

2. Haveg will use its broad experience in fighting corrosion to tell you if P-G is the best material. A reference file of installations plus systematic progress reports where available will be a valuable source of information.

Haveg P-G is new. It promises good dividends in many applications. But it calls for close cooperation between Haveg and the user. Call the Haveg sales engineer listed. Tell us your problem . . . together we will find if Haveg P-G fits your needs!

ATLANTA, Exchange 3821 • CHICAGO 11, Delaware 7-6088
CINCINNATI 36, Sycamore 2600 • CLEVELAND 20, Washington 1-8700
DETROIT 39, Kenwood 11785 • HOUSTON 4, Jackson 6840
LOS ANGELES 14, Mutual 1105 • SEATTLE 7, Hemlock 1351
ST. LOUIS 17, Mission 5-1223 • WESTFIELD, N. J., Westfield 2-7383

HAVEG CORPORATION
NEWARK 2, DELAWARE
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FACTORY: WILMINGTON 8, DEL. • Wilmington 3-8884
A SUBSIDIARY OF CONTINENTAL-DIAMOND FIBRE CO

WAUKESHA

CORROSION-RESISTANT CASTINGS from Created Metals

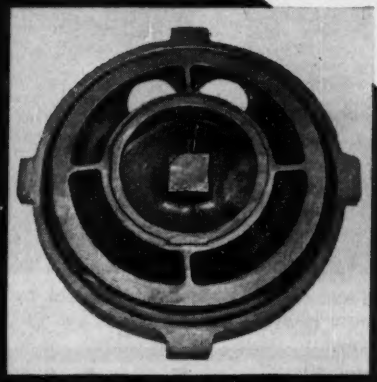
to help solve your tough product design problems

Problem—Do you require quality, corrosion-resistant castings that are a functional and sales asset to your products?

Solution—Consult with Waukesha—specialists in corrosion-resistant castings for products in many industries.

Why Waukesha—Background: You can draw on forty years' experience in producing quality, corrosion-resistant castings; and in "top" engineering guidance in casting design. **Craftsmanship:** Skilled craftsmen have developed techniques which guarantee you castings that are uniform, close-grained, free of porosity, metallurgically accurate in composition, dimensionally correct . . . castings requiring a minimum of machining. Metallurgical laboratory control of every production step assures you of castings precisely to specifications. **Created Metals:** Waukesha is a versatile foundry fully equipped to create the specific corrosion-resistant metals required by your castings. **Facilities:** Waukesha has the facilities to supply you with your production casting requirements.

Write today for casting quotation from your blueprints or counsel on your casting design. Informative literature on request. Waukesha Foundry Company, 5501 Lincoln Ave., Waukesha, Wis.



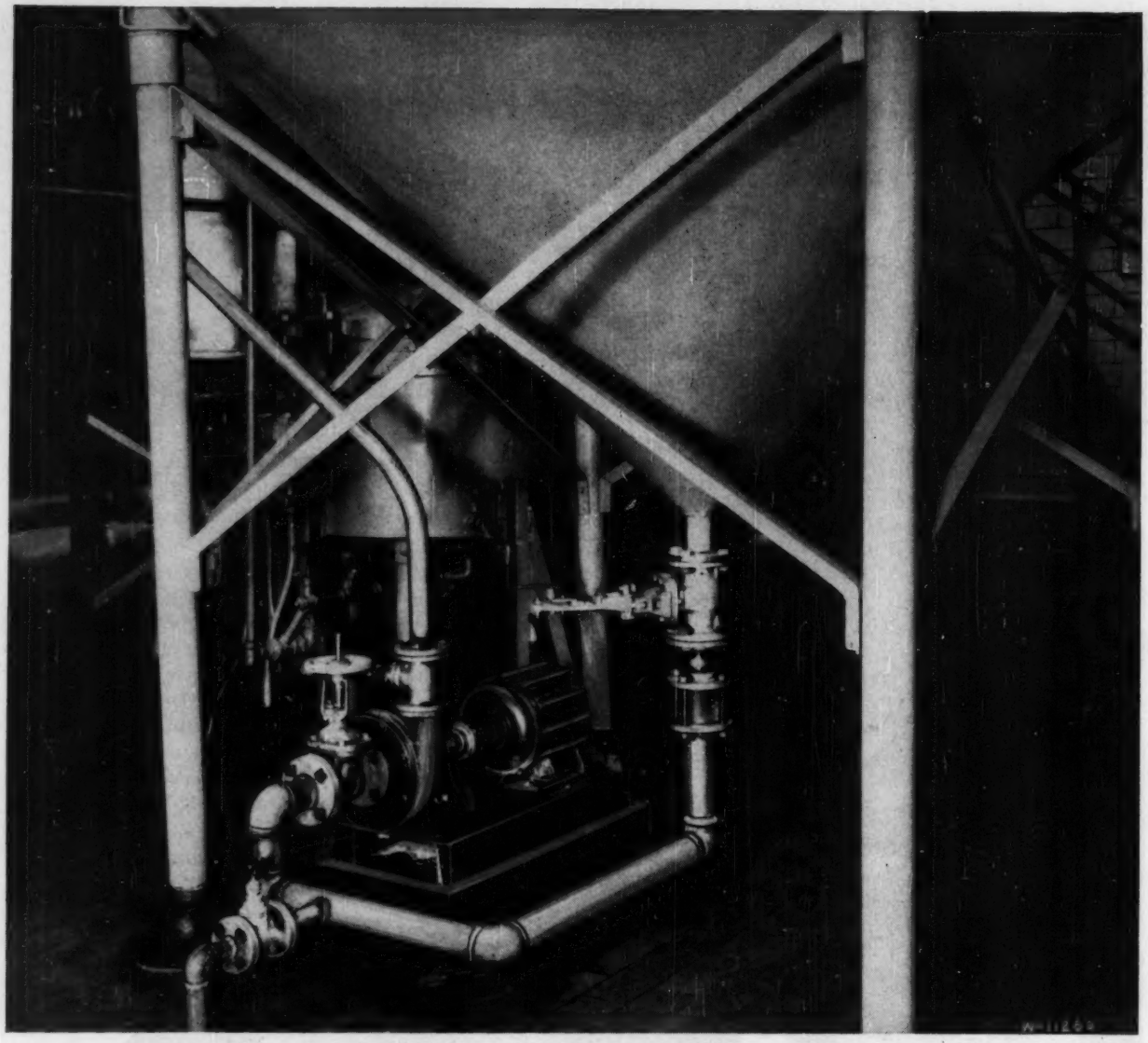
Waukesha Corrosion-Resistant Casting: nozzle box for a General Electric supercharger used in Diesel engines. This is typical of Waukesha's quality castings for many industries.

Waukesha is known for outstanding craftsmanship in the foundry.



Waukesha Foundry Company
WAUKESHA, WISCONSIN

WAUKESHA: SPECIALISTS IN CORROSION-RESISTANT CASTINGS FOR ALL INDUSTRIES



MOTHER LIQUOR and naphtha are pumped from separating tank to neutralizer tank by a 1½" Worthite pump, one of many at the Bayer Aspirin plant in Trenton, N.J.

No pumping headaches at Bayer Aspirin

With millions of aspirin tablets to turn out daily, the Trenton, New Jersey, plant of the Bayer Company can't afford many headaches over pumping.

As a matter of fact, they don't have *any*. For more than seven years, their corrosion-resistant Worthite pumps have been handling every solution in the aspirin-making process — acetic anhydride, naphtha, benzol, and all resultant liquors — without a sign of trouble.

If you've got a pumping problem involving corrosive fluids, chances are you'll find the answer in a Worthite pump. Get all the facts on these rugged units by writing for Bulletin W-350-B16 to Worthington Corporation, Centrifugal Pump Division, Harrison, New Jersey. C.4.4

WORTHINGTON

Type CNG Worthite Chemical Pump • **SESC (Standard End Suction Centrifugal)** • **Type KEB Worthite Propeller Pump**

Sizes ¾ to 6". Capacities to 2000 gpm; heads to 200 ft.

General Service Pumps CNF, CNE, CNR. Capacities to 2600 gpm; heads to 550 ft.

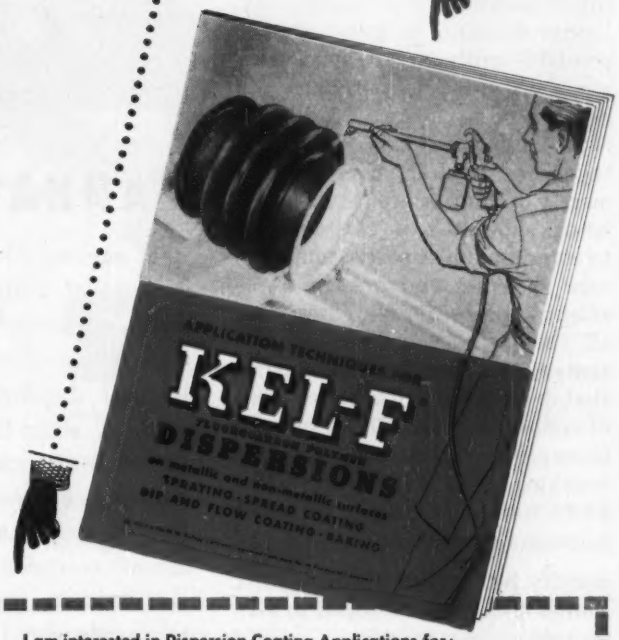
Sizes 8 to 24". Capacities to 19,500 gpm; heads to 20 ft.

Find the Newest Answer to

CORROSION CONTROL

in this 20-page KEL-F® Dispersions Manual

Learn how you can get the advantages of KEL-F fluorocarbon plastic: corrosion and heat resistance, anti-adhesion, abrasive resistance, excellent electrical properties, moisture resistance *in a dispersion coating, for application by spraying, dipping or spreading*



® Registered trademark of The M. W. Kellogg Company's fluorocarbon polymers

KELLOGG

THE M. W. KELLOGG COMPANY
Chemical Manufacturing Division
P. O. Box 469, Jersey City 3, N. J.

Please send me my copy of the new Kellogg Manual, "Application Techniques for KEL-F® Fluorocarbon Polymer Dispersions."

Name _____
Title _____
Company _____
Address _____
City _____ State _____

I am interested in Dispersion Coating Applications for:

- ☐ trailer tanks
- ☐ tankcars
- ☐ storage tanks
- ☐ pipe lines
- ☐ pumps
- ☐ mixers
- ☐ valves
- ☐ flowmeters
- ☐ reactors
- ☐ shipping containers
- ☐ waste neutralizers
- ☐ agitators
- ☐ calendering rolls
- ☐ forming dies
- ☐ guide rolls
- ☐ mattress molds
- ☐ tire molds
- ☐ ribbon blenders
- ☐ cone blenders
- ☐ hoppers
- ☐ casting molds
- ☐ coated glass tape
- ☐ miniaturized stators
- ☐ distribution transformers
- ☐ miniaturized relays

Other applications (please list) _____

HOW TO BUY RUBBER LININGS

FOR BONDED PROTECTION OF EQUIPMENT AND PROCESSES

Look for rubber linings that provide maximum resistance to acids, alkalis and temperature . . . a bond of rubber to metal that is permanent and inseparable, to guard against equipment corrosion and process contamination . . . and a company with a long established reputation, with up-to-date facilities to handle any problem you may have. Your investment in processing tank linings warrants long-lasting, dependable protection against inorganic acids and their salts. Your best assurance of longer tank life is to insist on thick, non-porous layers of rubber, rather than merely a film or coating. Tank linings should also be compounded to stand up under severe temperature extremes and present a resilient, non-breakable surface at all times under ordinary conditions of use. Look for the company that demonstrates a superior bond of rubber-to-metal. If it's so good it can't be separated without breaking, you can be sure the protection of your equipment and solution is permanent.

Specify by name the rubber tank linings specially developed to give you these advantages . . . specify Manhattan Rubber Linings.



MANHATTAN RUBBER LININGS

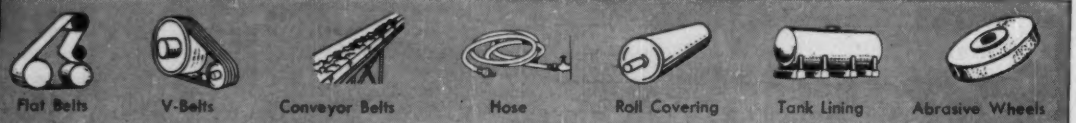
R/M engineers have developed a method of bonding rubber to metal so securely that tests prove it can't be pulled off. Manhattan Rubber Linings expand and contract with the metal under temperature changes without hardening or cracking. The linings provide permanent protection against corrosion and contamination because they are made of thick, calendered sheets of natural or synthetic rubber. The resistance of Manhattan Rubber Lining to most acids, caustics and alkalis is practically permanent. In addition, every Manhattan Lined Tank is tested to 15,000 volts to detect any possible imperfections . . . to make certain your tank lining offers sure, *bonded* protection for your chemical processes and equipment. Let an R/M rubber lining engineer show you why Manhattan Rubber Linings last so much longer.

RM-521

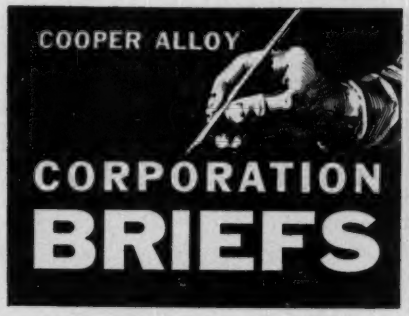
RUBBER LINING PLANTS AT PASSAIC, N. J., NORTH CHARLESTON, S. C.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls



• Edited by GEORGE BLACK

IT COULDN'T BE CAST... BUT IT WAS

You'll be hearing a lot of talk about the jet engine support which foundries had tried to cast in green sand, dry sand, core mold and lost wax. They said it couldn't be cast . . . but they didn't count on that COOPER ALLOY *advanced know-how* which has made the difference in so many cases. It's now a regular production item in our Foundry Products Division . . . in spite of the fact that each piece is custom cast. Shell molding plus experience and the will to tackle the tough ones, did the trick. If you haven't reserved your set of Advanced Know-How case histories which are soon to be published—there's still time. A note on your company letterhead is all you need.

VALVES IN PAPER AND PULP

Chief Engineer of Cooper Alloy's Valve and Fitting Division, Perc Shaffer, recently delivered one of the most comprehensive lectures on the subject of stainless steel valves in the pulp and paper industry. It was printed in toto in the Pulp and Paper Magazine of Canada, and is now available in reprint form from our technical librarian.

VANTON PUMP MOVES

Vanton Pump & Equipment Corp. has announced the removal of its executive and sales offices from the Empire State Building in New York to the plant location at Sweetland Avenue, Hillside, N.J. The move is the result of increased design and production activity which demands closer liason between operating and management levels. We anticipate faster action on design changes to increase the versatility and usefulness of this unique pump without a stuffing box. The first such change, involving the shift of bearings to the exterior of the housing, has just been completed. Details on request!

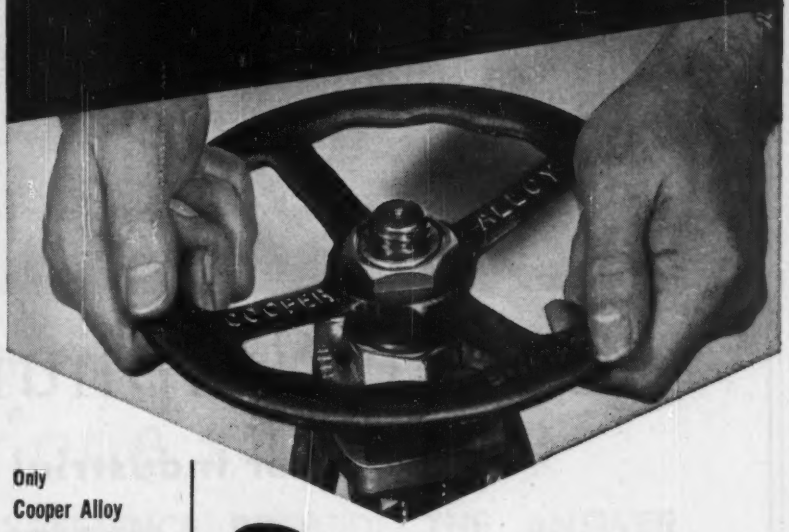
COOPER ALLOY
CORPORATION • HILLSIDE, N.J.

NO. 1 / COOPER ALLOY VALVE FEATURES



EASY OPENING EASY CLOSING

with large handwheel



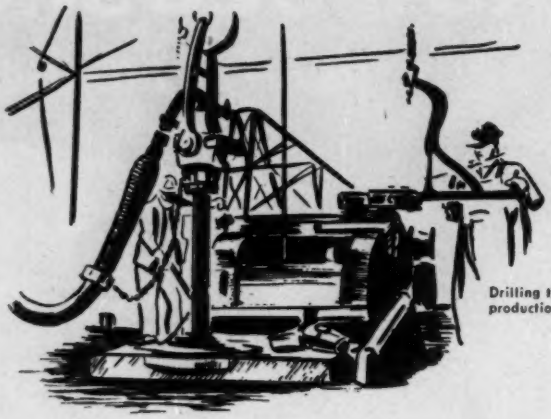
Only
Cooper Alloy
stainless steel valves have all these features!

1. Large handwheel
2. Extra heavy seats stems, discs
3. 100% x-ray of vital cast components
4. Centerless ground stem
5. Ball and socket rotating type discs
6. Extra deep stuffing box
7. Two-piece gland construction
8. Swinging eyebolts
9. Bowed yoke construction
10. Yoke cap designed for quick replacement

Stainless steel valves are precision instruments. When properly manufactured and cared for, they should open easily as well as provide tight closure. The Cooper Alloy line is designed with an oversized hand wheel to permit fatigue-free hand operation and to make unnecessary the use of wrenches, bars or other "persuaders" which may do serious damage to the disc and seat and multiply the possibility of galling.

New Catalog! A note on your company letterhead will reserve your new 1955 Cooper Alloy valve and fitting catalog.

COOPER ALLOY
CORPORATION • HILLSIDE, N.J.
Valve & Fitting Division


Drilling the production wells

Crude Sulphur

for Industrial Use

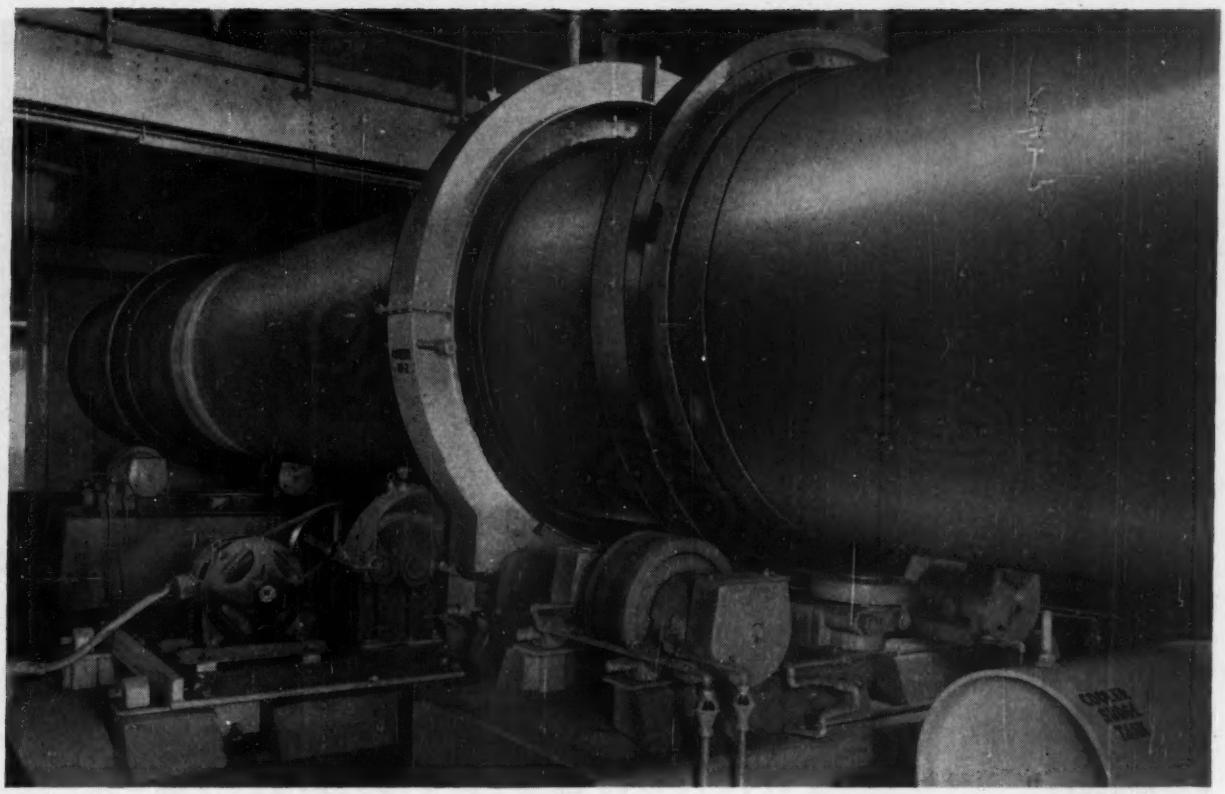
from the properties of

Texas Gulf Sulphur Co.

75 East 45th Street • New York 17, N. Y.

Producing Units

- **NEWGULF, TEXAS**
- **MOSS BLUFF, TEXAS**
- **SPINDLETOP, TEXAS**
- **WORLAND, WYOMING**



IF YOUR MATERIAL COOLING PROBLEM IS

a "hot" one to handle

LET TRAYLOR'S EXPERIENCE PROVIDE THE ANSWER

Controlled cooling of hot materials with Traylor Rotary Coolers has enabled many processors to greatly increase production efficiency and quality.

Every Traylor Cooler is "Traylor-Made" for its job only after careful study by Traylor engineers of the process involved. With over half a century of experience to provide the right answer, Traylor is well qualified to handle your "hottest" cooling problems.

Traylor builds several types of Rotary Coolers to meet practically all cooling requirements. Why not get in touch with us today. Let us show you why there is no substitute for a "Traylor-Made" Cooler.

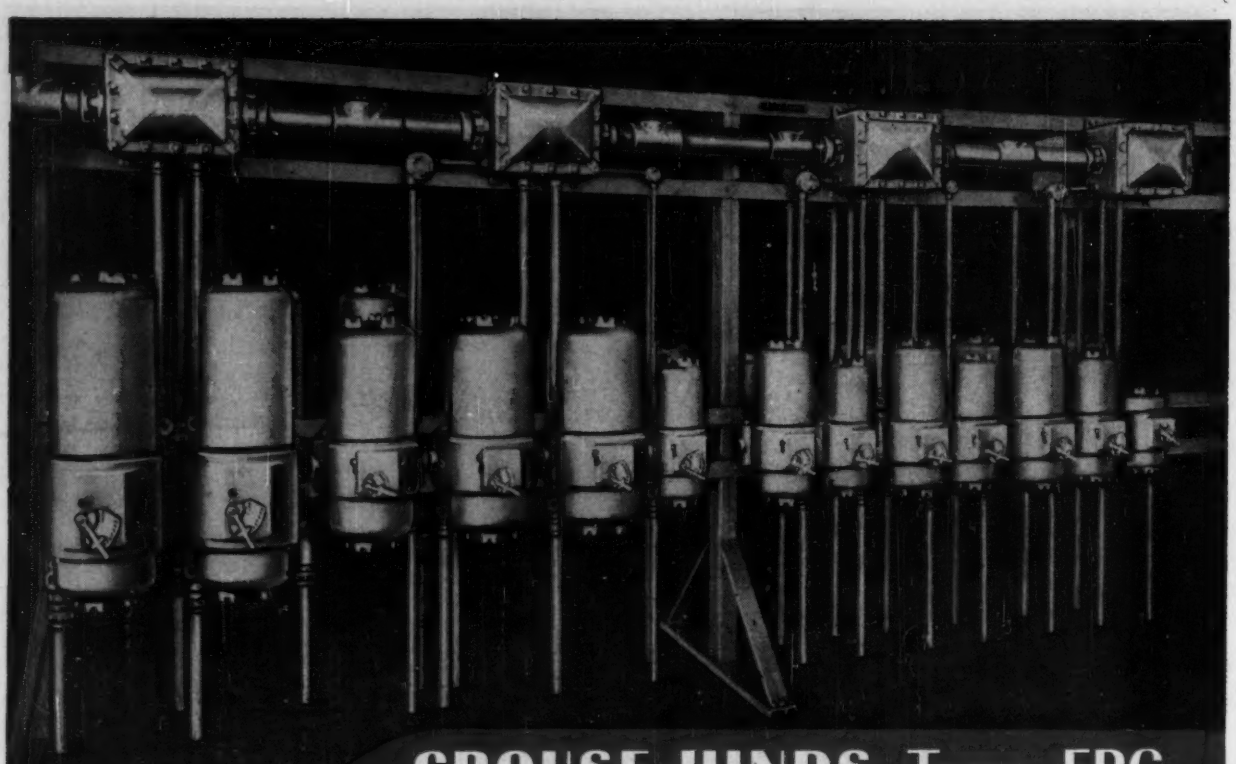


TRAYLOR ENGINEERING & MFG. CO.
721 Mill St., Allentown, Pa.
Canadian Mfrs.: Canadian Vickers, Ltd., Montreal, P. Q.

A Traylor leads to greater profits

SEND FOR BULLETINS
. . . just mention the Traylor Equipment that interests you.

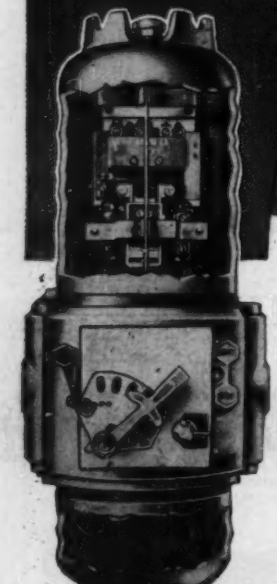
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CROUSE-HINDS Type EPC

MOTOR STARTER and CIRCUIT BREAKER

Explosion-Proof CONDULETS* are compact!



Type EPC Combination Line Starter Condulet with Broken-Away Covers Showing Interior Starter and Circuit Breaker Assembly

Little space required for a big installation

Crouse-Hinds exclusive vertical cylindrical design conserves horizontal space that is always at a premium, speeds up installing and wiring, and saves money on the construction of steel mounting racks.

- **Explosion-proof, dust-tight, and weather-resistant** (raintight).
- **Light-weight cast aluminum** — for easy installation and maintenance. No lifting equipment required. Saves time and money.
- **Flame-tight threaded joints** throughout — the type of construction that was pioneered by Crouse-Hinds. Covers are taper-threaded with seven threads for extra safety. Operating shafts and bushings are thread-in-thread construction.
- **Seven conduit entrances** — give you the choice of either vertical or horizontal "through feed", "U" at either top or bottom, "T", or "L" at either side or back. Saves money by simplifying installation. Large central body — for easy wiring.
- **Built-in push button stations** and built-in selector switch are available.
- **Versatile.** Wide selection of well known controls. Starter sizes 0 to 5. Circuit breakers 50 to 600-Amp. frame sizes.
- The Crouse-Hinds Type EPC advantages all add up to **lower installed cost** and **lower maintenance cost.**

CONDULETS are made only by CROUSE-HINDS

A Nationwide Distribution Through Electrical Distributors

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES Amarillo — Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City Los Angeles — Memphis — Milwaukee — New Orleans — New York — Philadelphia — Pittsburgh — Portland, Ore. — San Francisco — Seattle — St. Louis — St. Paul — Tulsa Washington. RESIDENT REPRESENTATIVES Albany — Atlanta — Baltimore — Charlotte — Chattanooga — Corpus Christi — Reading, Pa. — Richmond, Va. — Shreveport Crouse-Hinds Company of Canada, Ltd. Toronto, Ont.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS



look what's happening to Culpepper

Robert E. Lee Culpepper, that is. And no finer black-eyed-pea-lover ever crossed the Mason-Dixon Line to work in a New Jersey chemical plant. He's a comer, this boy!

"Found the pace a mite fast at first up here in Yankeeland," writes Bob. "But you fellows on CHEMICAL ENGINEERING really brought me up-to-date fast with the *Annual Inventory Issue*. Got a raise and promotion since last October, next week I'm getting my own office – my super treats me like I just married the boss' daughter".

Yessuh! Young Robert is really tearing up the pea patch – taking over that plant like Grant took Richmo . . . . Oops! Well, anyway, he's doing fine and, we understand, right in line for a Production Manager's job coming up this Fall.

Yup! North, East, South, West! They're writing us about this *Inventory Issue* from all over the busy Chemical Process Industries map. Maybe this practical, all-in-one-spot reference has already paid off for you. Or maybe you haven't gotten round to using it yet. If not, why not dust it off for a second look? You won't find a more comprehensive and usable fact-file anywhere – or a more realistic help to you on the job.

Sure, there's another one coming up in October, but let's get some mileage out of this one right now. After all, look what it's doing for Culpepper!

ANNUAL INVENTORY ISSUE

Chemical Engineering

A McGRAW-HILL PUBLICATION, 330 WEST 42ND STREET, NEW YORK 36, N.Y.

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WALSEAL® VALVES AND FITTINGS



Better because . . . **There's no guesswork when a silver-brazed joint is made with a Walseal fitting. Sil-Fos alloy, which appears as a fillet at the face of a Walseal joint, comes from rings which have been factory-inserted in the end connections of Walseal fittings. The bright silver alloy fillet that you can see assures full penetration of alloy for a permanently leakproof joint.**

Cutaway view of a Walseal Tee showing: factory-inserted ring of silver brazing alloy; fillet of silver brazing alloy that appears upon completion of Walseal joint; cutaway view of the completed joint showing that silver brazing alloy has flowed in both directions from the factory-inserted ring.

Walseal is a registered trade mark identifying bronze valves and fittings manufactured by the Walworth Company. Walseal products have factory-inserted rings of silver brazing alloy in threadless ports. Walseal joints can be made only with Walseal valves and fittings.

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*Walseal fittings and valves are being used at sub-zero temperatures as low as —350 F.

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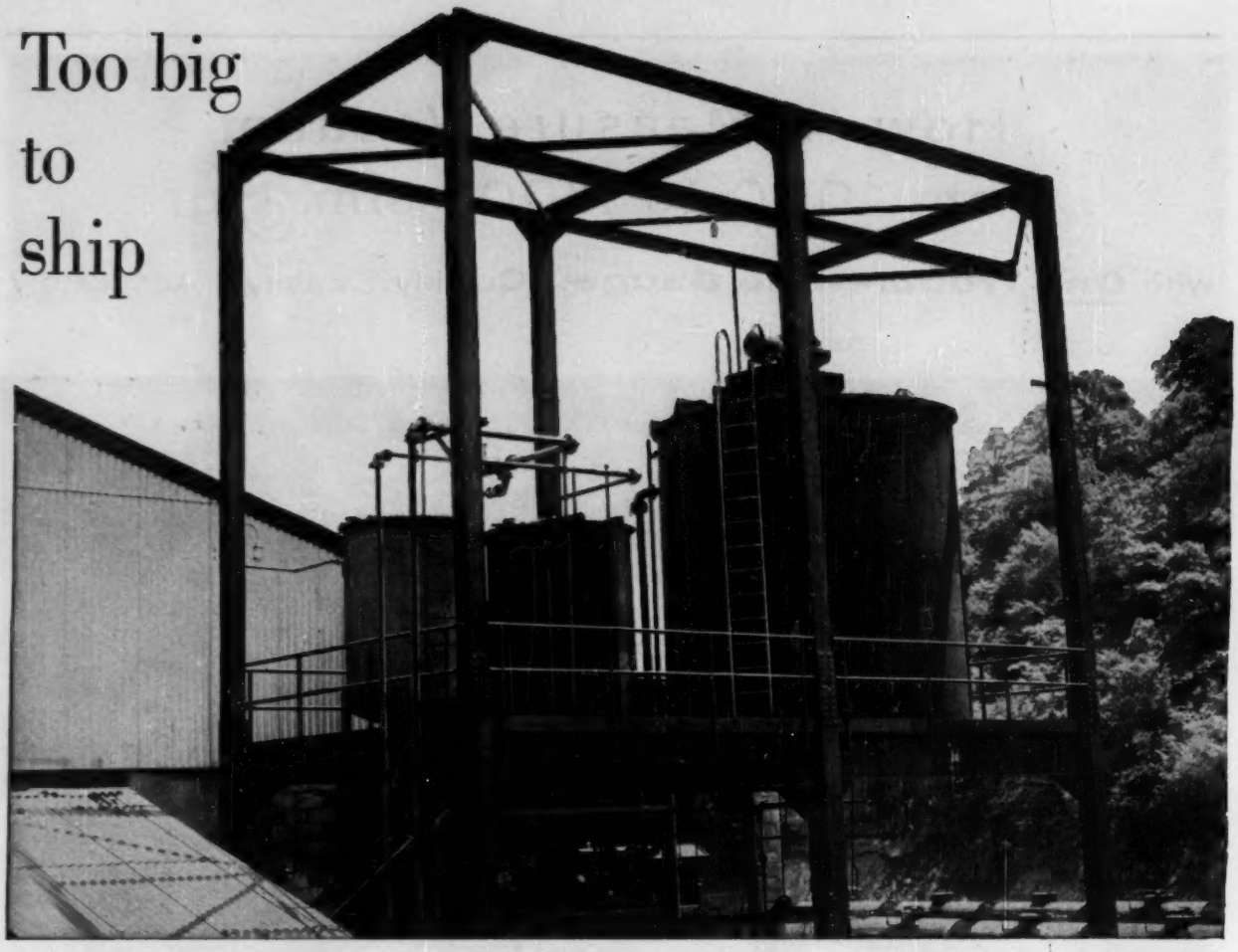
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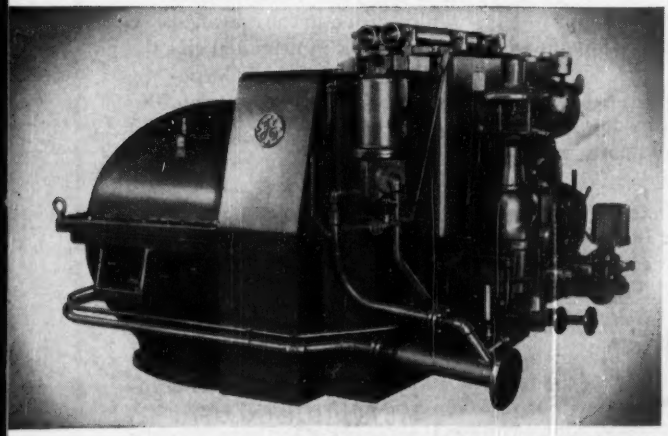
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OIL DAM IN UPPER BEARING HALF, located at pencil point, restricts oil flow around shaft, building up a pressure pad as shown at left. As turbine gains speed, oil pressure increases and forces shaft down into ample surfaces of lower bearing liner, above right, assuring stability at high speed.

Large pressure-pad bearings add years of life to G-E high-speed turbines



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The editors have been snowed under with comments, compliments, criticisms . . . Reader Service requests will hit 60,000 before the next issue's out . . . and thanks to you, we're getting plenty of new ideas for the 1955 edition.

Keep 'em coming . . . but hurry! Publishing date's October . . . and we want all the help we can get to make this year's *Inventory Issue* better'n ever.

ANNUAL INVENTORY ISSUE

Chemical Engineering

A McGRAW-HILL PUBLICATION, 330 WEST 42ND STREET, NEW YORK 36, N. Y.

THE YORK ADVERTISEMENT on the following two pages is the first appearance in this magazine of a new information series on York Refrigeration Equipment and its uses.

CUT OUT AND SAVE THIS ADVERTISEMENT and the others that follow. The full series will appear over a period of many months and will give you a comprehensive picture of York equipment *as it is used in your industry*.

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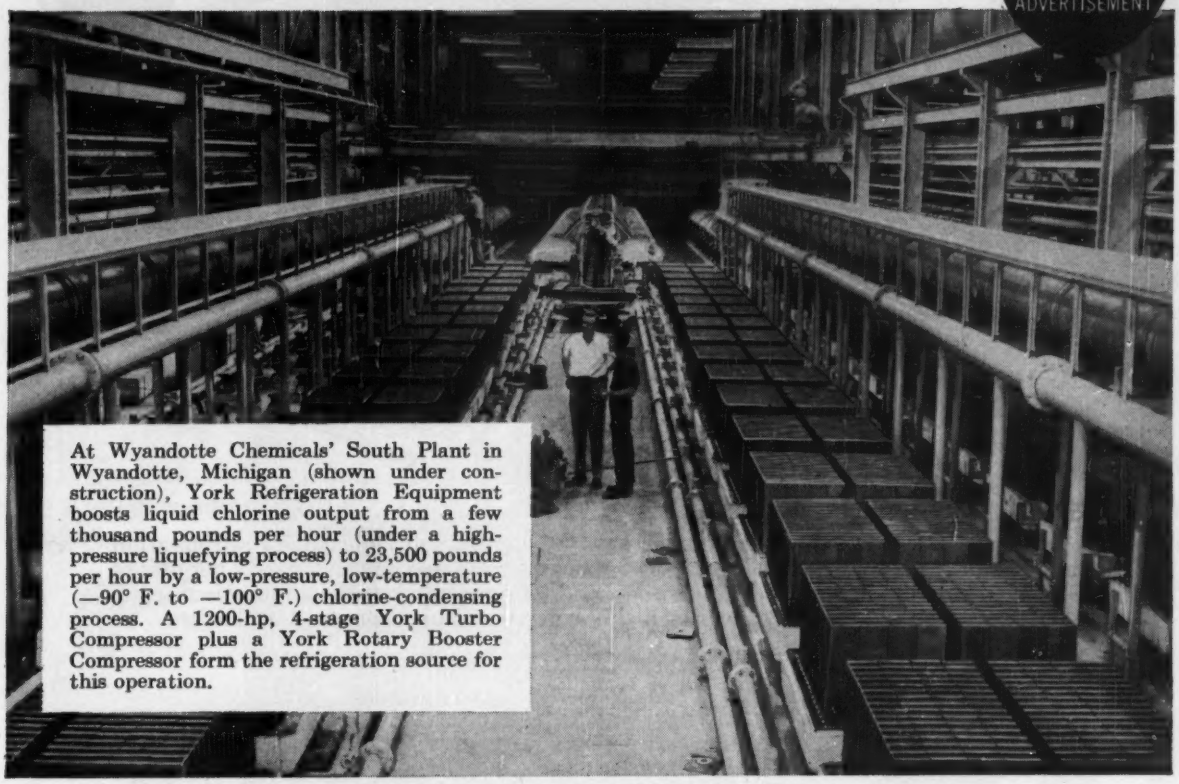
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NEW facts for your files on York Turbo Compressors for

Chemical Plants

INFORMATION ADVERTISEMENT



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Some Helpful Hints for Chemical Men

1. To block radiant heat from motors near hot equipment, circle the motor with a fine-mesh screen similar to that in the masks worn by steelworkers near hot operations. Leave the ends open to keep normal circulation.

2. A quick, easy way to seal small leaks in vacuum or low-pressure systems is to melt a piece of polyethylene tubing around the leak. This forms a corrosion-resistant seal which can easily be removed by burning or cutting.

3. To increase the life of wooden pallets, bands of steel should be stapled under tension around the pallet. The bands should circle the pallet and go under the runners. This will prevent distortion and splitting of the pallet and keep the nails anchored.

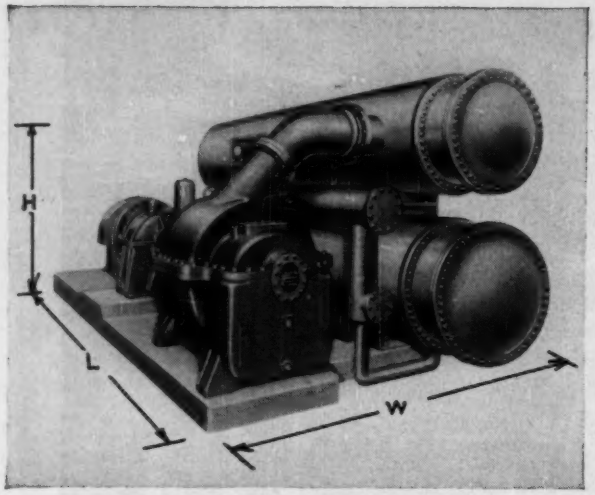
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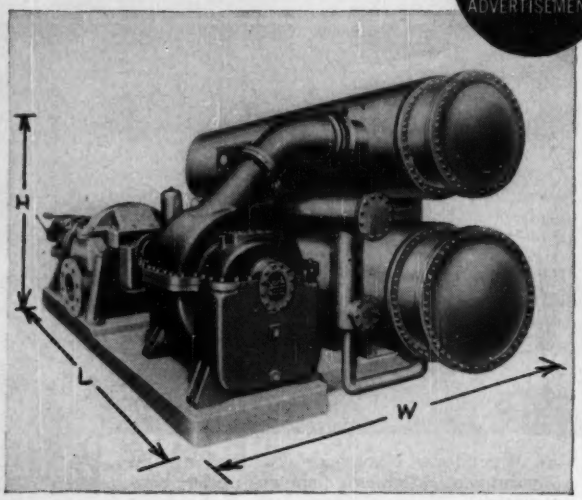
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YORK TURBO COMPRESSORS

INFORMATION ADVERTISEMENT



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STEAM TURBINE DRIVE

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(Depending on model chosen)

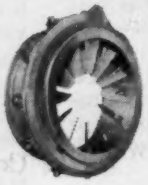
Type	"L"	"W"	"H"
Motor Drive	14′6″ to 20′9″	9′9″ to 15′10″	6′8″ to 12′8″
Steam Turbine Drive	14′6″ to 16′0″	9′9″ to 15′10″	6′8″ to 12′8″

NOTE: Dimension "L" will vary with type and size of motor and gear, or with type of turbine. All dimensions are based on 2- and 4-pass shells. Purge device adds 21′ to overall "W" dimension.

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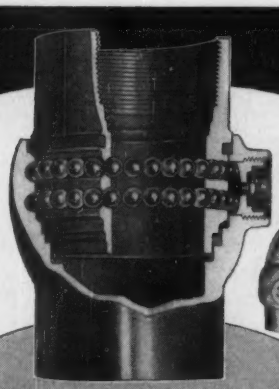
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No. 50FX5

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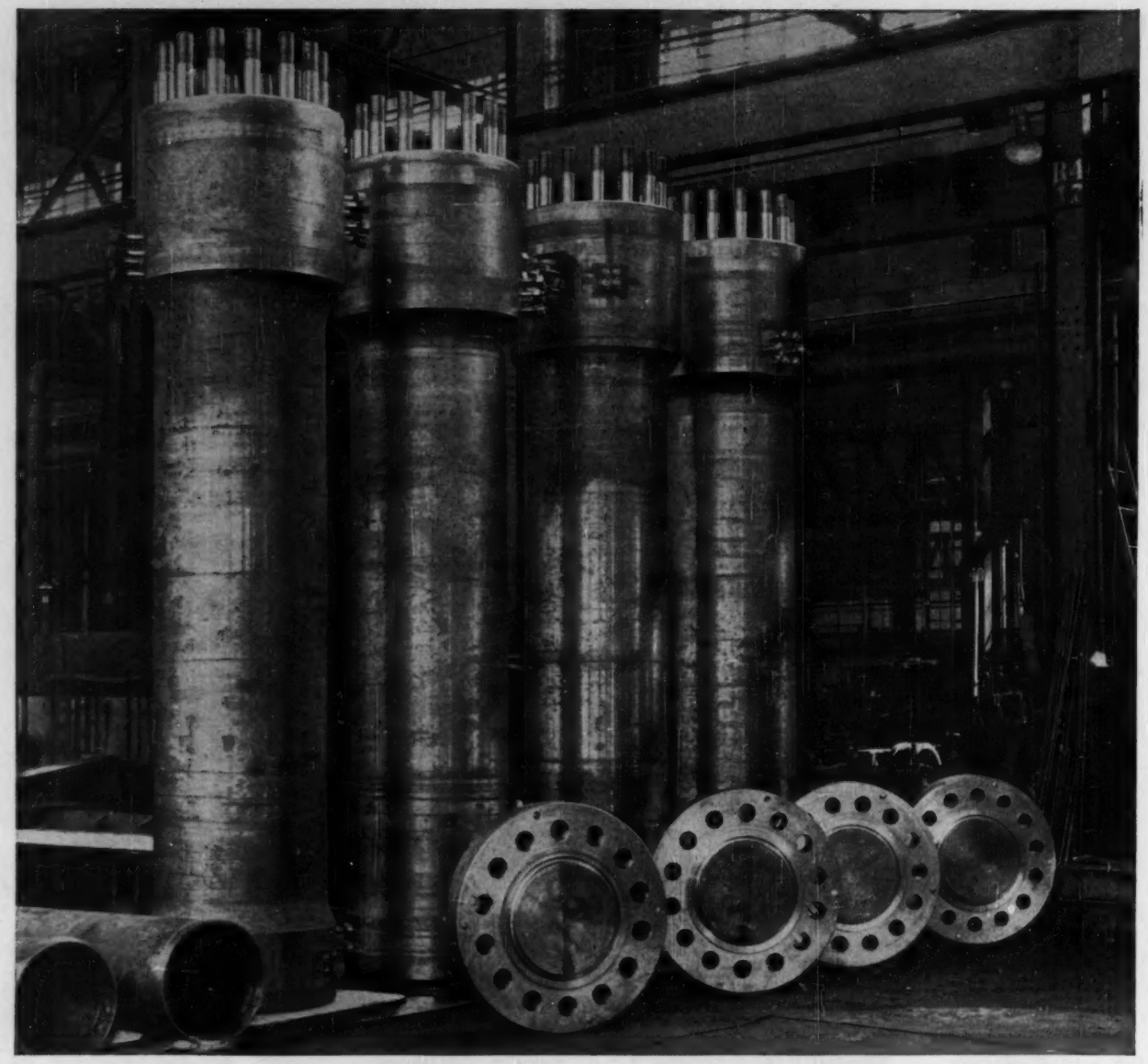
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This WHERE TO BUY Section supplements other advertising in this issue with these additional announcements of products and services essential to efficient and economical operation in the process industries.

5 CORROSION CONTROL SERVICES . .

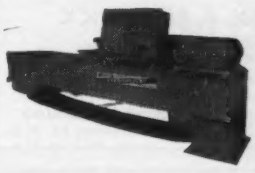
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Economic - SURVEYS - Technical
Process DEVELOPMENT - Product
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DIRECTOR OF RESEARCH
PERMANENT ASSIGNMENT
SOUTH AMERICA

UNUSUAL OPPORTUNITY
- to organize and direct laboratory efforts as member of top-management team in large, rapidly-expanding South American affiliate.

THE MAN WE NEED MUST
- be ready and qualified to discharge executive-technical responsibilities
- be a chemist or chemical engineer with some knowledge of biochemistry preferred
- be an experienced administrator, with imagination, drive and keen commercial instincts
- be equipped with previous residence in South America, some knowledge of Spanish or Portuguese and a flair for living abroad.

IF YOU ARE THIS MAN
- send complete resume with recent photograph to:

Robert J. Dixson
Johnson & Johnson
New Brunswick, N. J.

CHEMICAL ENGINEERS
CHEMISTS
MECHANICAL ENGINEERS

Key production and engineering positions are available to men having above average professional and personal qualifications. Specific or extensive working experience not necessary. Interview arrangements to be based on review of full written resume of training, aspirations, personal qualifications, experience. All replies will be treated in a confidential manner.

REICHHOLD CHEMICALS, INC.
TUSCALOOSA, ALABAMA

SANITARY ENGINEER
Opportunity available for Sanitary Engineer in an expanding pulp and paper mill located in the Middle Atlantic States. Age 25-35 years. Require man experienced in Paper Mill wastes, Paper Mill stream pollution and Paper Mill water purification. No other experience will be given consideration. Good salary and advancement. Send resume of educational background and industrial experience. All replies confidential.
P-5552, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

CHEMICAL ENGINEERS
An active, confidential service!
Interview at your convenience.
Call, write or wire
GLADYS HUNTING (Consultant)
DRAKE PERSONNEL, INC.
7 W. Madison St. Chicago 2, Ill.

ENGINEERS—ADMINISTRATORS
—SALESMEN—EMPLOYERS
Confidential, rapid and professional service for nation wide placement in the Chemical field. Write giving age, education and brief experience. Employers send us job description. We will let you know how we can help you by return mail.
Graebner's Chemical Exchange
"The Nation's Largest"
116 South Michigan—Room 706—Chicago 3, Illinois

CHEMICAL ENGINEERS

Excellent opportunities open to men who are qualified for Process Development, Production and/or Engineering Design fields. The work is related to the expanding operations of a long established midwestern chemical company and will provide opportunities at most levels of experience.

Applicants must be eligible for security clearance by AEC, and should submit complete resume of personal data, education, previous experience, salary desired and references. All replies will be treated in confidence.

P-5551, Chemical Engineering
520 No. Michigan Ave., Chicago 11, Ill.

(Continued from opposite page)

EMPLOYMENT SERVICES

SALARIED POSITIONS $5,000 to $35,000. We offer the original personal employment service (established 45 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 653 Brisbane Bldg., Buffalo 3, N. Y.

SALARIED PERSONNEL, $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. P, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

ENGINEER AVAILABLE — 20 years experience: rayon, nylon and chemical plant. Design, construction, operation and maintenance. 8 years with major rayon producer, past 3 years as Assistant Chief Engineer. Heavy administrative experience. Reply to PW-5567, Chemical Engineering.

CHEM. ENGR.—BS—4½ yrs. experience in product development, improvement, quality control & inspection of raw material, in-process material, & finished goods, & plant engineering. Presently employed in small plant. Interested in process in small plant. Interested in process development with opportunity for advancement. Desire southeastern location. PW-5546, Chemical Engineering.

CHEMICAL - METALLURGICAL Engineer — B.S.Ch.E., Age 29; licensed engineer. 6 years experience primarily in extractive metallurgy, heavy inorganic, and ore-dressing. Process design, development, and production. Consider all locations. PW-5283, Chemical Engineering.

CHEMICAL ENGINEER—Twenty years engineering, development and operating experience with a wide variety of inorganic and organic processes. Extensive equipment design selection and installation experience. Seeking connection with engineering or equipment company on project engineering, development or sales. Available 30 days. PW-5235, Chemical Engineering.

CHEMIST: OLDER man, long analytical experience, industrial materials, metals, steels, ores, ceramics, lubricants etc. PW-5348, Chemical Engineering.

POSITIONS WANTED

PLANT ENGINEER—BS ChE—1939. Stymied by divisional reorganization which prompts search for position utilizing experience in design, maintenance and construction of heavy chemical, fermentation and distillation equipment. Present salary $9000. PW-5391, Chemical Engineering.

SELLING OPPORTUNITIES WANTED

SALES ENGINEERING Organization with wide experience & contacts, wishes to represent manufacturer of Heat Exchangers & Allied Chemical Process Equipment on an exclusive basis in the Met. New York, North N. J. and S. W. Conn. territory. RA-4272, Chemical Engineering.

MIDWEST SALES Engineer, Ch.E., Chemical process equipment with valuable following throughout industrial midwest, desires representation or salary-commission arrangement. Headquarters Cleveland. No other lines. Age 40. SA-5332, Chemical Engineering.

New Sales Organization
Seeks exclusive rights for Ohio, Michigan or Indiana to represent allied lines of reputable and established manufacturers of equipment used in measurement and control of fluids. Contacts in petroleum and chemical fields with wide experience in construction, design, instrumentation, heat transfer and pumping equipment.
P. O. Box 181, Station B, Toledo 6, Ohio

WANTED—SURPLUS
Chemicals—Dyes—Drugs
Colors—Pigments—Oils—Waxes
By-Products—Wastes—Equipment
CHEMICAL SERVICE CORP.
80-04 Beaver St. New York 5, NY

WE NEED
All Kinds of Oil Refinery and Chemical Equipment, also Tanks
Write — Wire — Phone
Weinstein Co., Div. of Surplus & Salvage Co., Inc.
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CUSTOM REFINING FACILITIES . . .

AVAILABLE
- Complete Distillation Service
- Distillations
- Extractions
- Fractionations

WANTED
- Drum Lots—Tank Cars
- All Types of Crude Mixtures
- By-Products, Residues, Wastes
- Contaminated Solvents

Truland CHEMICAL & ENGINEERING CO., Inc.
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LIGHT DENSITY PRODUCTS
Filled into Bags instead of Drums
Complete Bagging Station For Sale
Box 157 — Yorktown Hts., N. Y.

Additional Position Vacant Advertising on page 384

PETROCHEMICALS

The Standard Oil Company (Ohio)
Petrochemical Department
is looking for

TECHNICAL SUPERINTENDENT
CHIEF PROCESS ENGINEER
CHIEF CHEMIST

for its new nitrogen petrochemical operations in Lima, Ohio. Applicants should have the following educational background and industrial experience:

Technical Superintendent: degree in Chemical Engineering or equivalent; experience in at least two of the following three fields—process engineering, mechanical, civil, or electrical engineering at the plant level, and control laboratory—with a minimum of eight years total with four in a supervisory capacity; age range 30–45.

Chief Process Engineer: degree in Chemical Engineering or equivalent; at least five years' experience in the field of chemical engineering; age range 25–40.

Chief Chemist: degree in Chemistry or Chemical Engineering or equivalent; at least six years' experience in chemical or petroleum control laboratory including two years in supervisory capacity; age range 25–40.

Salaries commensurate with experience and level in organization. Advancements on merit basis.

If you can qualify and are looking for a permanent job with a growing but secure midwest company, write, giving full information on education, industrial experience, military experience, and personal data to E. G. Glass, Jr., 1770 Midland Building, Cleveland 15, Ohio.

CHEMICAL ENGINEER

Chemical Engineer experienced in resistance films and resistor materials needed for printed circuit research and development program in the Research Department of an Ohio manufacturer of electronic equipment.

Man accepted will be responsible for this phase of work and will report directly to the department head.

Salary open. Replies held in confidence. Allowance for moving expense.

Submit resume to

P-4811, Chemical Engineering
330 W. 42 St., New York 36, N. Y.

PROCESS DESIGN ENGINEERS

A progressive, major, engineering and contracting firm has openings in its Process Design Department for qualified chemical engineers with one to ten years of experience in the process design of petroleum refinery and chemical plant facilities. Offices are in Cleveland, Ohio, convenient to desirable residential suburbs.

All replies are confidential. Send details of education, experience, expected salary, and photograph to:

E. A. Kolner
ARTHUR G. McKEE & COMPANY
2300 Chester Avenue, Cleveland 1, Ohio

WANTED

ORGANIC CHEMISTS

Ph.D. or equivalent for research and experimental work. Fast growing chemical plant in West Virginia's Ohio River Valley section. Establishing research group. New modern Laboratory now under construction.

P-5454, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

CHEMICAL ENGINEERS

Several needed for process development and production work. Three to five years' experience preferred. Modern expanding chemical manufacturing plant in West Virginia's Ohio River Valley section. Engineering now in progress for several new products. Modern research and development facilities now being constructed. Excellent opportunities.

P-5451, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

2 RESEARCH ENGINEERS

1. A research engineer with chemical background to undertake applied research work on soldering and brazing of aluminum alloys. Several years of industrial experience is desirable. Excellent opportunities are available and the salary is commensurate with ability.

2. A research engineer to undertake applied research work on resistance welding, pressure welding and mechanical joining of aluminum alloys. A good knowledge of electricity, physics and metallurgy is essential. Several years of industrial experience is desirable. Excellent opportunities are available and the salary is commensurate with ability.

All applications should be directed to L. A. Cook:

Department of Metallurgical Research

JOINING SECTION,
KAISER ALUMINUM & CHEMICAL CORPORATION,
Spokane, Washington

CAPACITOR ENGINEER

Engineer or scientist experienced in ceramic capacitor materials, design and processes needed for printed circuit research and development program in the Research Department of an Ohio manufacturer of electronic equipment.
Man accepted will be responsible for this phase of work and report directly to the department head.
Salary open. Replies held in confidence.
Allowance for moving expense.
Submit resume to

P-5437, Chemical Engineering
520 N. Michigan Ave., Chicago 11, Ill.

CHEMICAL ENGINEERS

Permanent positions with excellent growth opportunities are available in central Engineering division of multi-plant manufacturer of diversified industrial chemicals.

The work consists of process development and design, construction follow-up and operation consultation.

Positions require graduate chemical engineers with 2-5 years appropriate experience. Central New York state location.

P-5263, Chemical Engineering
330 W. 42nd St., New York 36, N. Y.

ENGINEERING OPPORTUNITY IN HEAT TRANSFER

The Trane Company offers you an outstanding opportunity in the field of heat transfer equipment sales—process heat transfer or aircraft heat transfer.

If you are a mechanical, chemical or aeronautical engineer, interested or experienced in heat transfer there is a position open as assistant to a product manager in the rapidly expanding Heat Transfer Department. Interest in aeronautics, petrochemistry or process design helpful but not essential. Exceptional promise of advancement in engineering, sales and administration. Write giving qualifications:

Manager Staff Employment
THE TRANE COMPANY
La Crosse, Wisconsin

CHEMICAL ENGINEER

With good background in chemical technology wanted by progressive equipment designing and manufacturing company in Western Pennsylvania. Please submit record of education, experience, references and salary expected.

P-4911, Chemical Engineering
330 W. 42nd St., New York 36, N. Y.

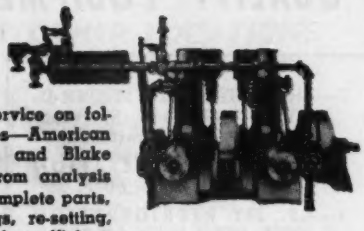
PROJECT ENGINEER
CHEMICAL PLANT EXPERIENCE

National Rubber Company has excellent opportunity for Project Engineer with 5-10 years experience in design and construction of chemical plants. Will manage projects from pilot plant stage through to completion, acting as owner's representative with engineers and building contractors. Steady employment, good future.
Please forward complete resume of education, experience and salary requirements to
P-5350, Chem. Engr., 330 W 42 St., NY 36, N. Y.

Consolidated Services and Equipment

SAVE "DOWN TIME" AND $$$ WITH THESE MAINTENANCE SERVICES

STEAM ENGINE AND PUMP REPAIRS



We render complete maintenance service on following types of engines and pumps—American Ball Engines, Harrisburg Engines, and Blake Pumps. This includes everything from analysis of needs and recommendations, to complete parts, complete engine overhaul, re-borings, re-setting, re-building, or anything required for efficient, economical operations.

• Check this complete range of Services •

RETUBING—Fast retubing and repairs on all tubular equipment. Largest, best equipped shops in the country.

METAL SPRAYING—Worn mechanical parts restored. Thickness and diameters increased. Defects corrected. Any metal in wire from applicable to any other metal or surface.

STEAM ENGINE & PUMP REPAIRS—Complete maintenance service, from analysis of needs to rebuilding, on American Ball Engines, Harrisburg Engines, Blake Pumps.

INSTRUMENT REPAIRS on all types of electrical indicating, recording instruments, pyrometers, gages, etc. regardless of manufacture. We also manufacture:

SPECIALTIES to make your power plant run smoother. Coils, cleaning guns, plugs, condenser ferrules, fibre plugs, flowrite heat exchanger tubes, etc. etc.

REDESIGNING AND REBUILDING — Used equipment restored through simple repair or redesign and complete rebuilding. Emergency service. Maintenance and spare parts service, day, night, Sundays, holidays.

24-HOUR SERVICE EVERY DAY SUNDAYS, HOLIDAYS

"Consolidated" gives you the facilities of the country's largest rebuilding shop for ASME-U69 code work. We recondition thoroughly and promptly HEAVY PROCESSING EQUIPMENT. We also repair and build Pressure Vessels, Jacketed Kettles, Vulcanizers meeting code requirements.

TUBULAR EQUIPMENT

We have on hand one of the largest stocks of tube sheets, cupro nickel, admiralty and aluminum tubes, plain and finned, enabling us to give you immediate service. Repairs may be done in our shops or our crews will visit your plant for retubing and repair of Heat Exchangers, Condensers and other types of tubular equipment.

NEW EQUIPMENT

We also manufacture CONDENSERS, HEAT EXCHANGERS, PRESSURE VESSEL ROTARY KILNS, DRYERS AND COOLERS, ROTARY MIXERS AND BLENDERS. Ask us to quote on your requirements.

EXPERIENCE

Our 38 years of experience in rebuilding and furnishing a broad line of EQUIPMENT to the PROCESS INDUSTRIES is your best assurance of satisfaction. No matter how urgent your requirements, we are ready to serve you.

For Prompt Service phone, wire or write

MAINTENANCE DIVISION

Save on These Items

2—1000 gal. Monel Jktd. Agit. Closed Kettles
1—2TH Micro Pulverizer
3—#12 Sweetland S.S. Filters.
1—Buflovac 48" x 40" Drum Flaker, Chrome plated, S.S. ends.
16—Sperry 18" x 18" iron recessed Filter Presses, 12 Chambers.
1—Fitzpatrick Stainless Comminutor Model D. Reversible, M.D.
1—American 24 x 36 Dbl. Drum Dryer, Complete.
1—Read Standard horiz., dbl. ribbon Mixer, center disch. 8' x 36" x 42", 2,000#, 480 gal., practically new.
1—Day #30 Imperial dbl. sigma blade, jack. Mixer, 75 gal.
3—Cotton 8½ single punch Tablet Machines, M.D.
3—3' x 50' Rotary D. H. Dryers or Coolers.
2—Link-Belt Co. S/S 5'2" x 16', No. 502-16 Roto Louvre Dryer.
2—CME Cont. S/S Centrifugal, Solid bowl, 21" & 30" x 40".

MEMO ..... *Sell your idle machine —or entire plant quickly and confidentially. Send list today.*

CONSOLIDATED PRODUCTS CO. INC.

Our 38th Year

ON OBSERVER HIGHWAY, HOBOKEN, N. J. Tel.: HOboken 3-4425

DAY, NIGHT AND HOLIDAY SERVICE
N.Y.TEL.BArclay 7-0600
Cable Address: "Equipment" Hoboken, N. J.

WANTED BY A LARGE ENGINEERING COMPANY

FOR ERECTION AND EXPANSION OF A CHEMICAL PLANT

Will give consideration to all offerings of equipment listed below and adapt available items to our needs since plans are flexible:

Stainless Steel Reaction Kettles & Stills (up to 1750 gallons).
Stainless steel Tanks (up to 8500 gals).
Filters—Pressure types, Rotary types, Plate types.
Mixers—heavy duty Baker Perkins type and Dry Mixers.
Tablet and Preform Pressing machines.
Screens—Rotex type.
Centrifuges—Basket and Bowl types.
Dryers—Shelf Atomspheric and Vacuum type, Rotary Vacuum, Rotary Flaker and Double Drum Rotary.
Raymond and Williams type Roller Mills.
Grinding and Pulverizing machines including Roller Mills of high-speed type, Micro and Fitzpatrick Comminutors, Pebble and Rotary Ball Mills.
Vacuum Pans and Evaporators.
Autoclaves.
Kilns and Coolers.
Fractionating Columns.

Address: Box 1351; Church Street Station, New York 8, N. Y.

$6,000,000 LIQUIDATION

Selling Fast!! **CHEMICAL PLANT BATON ROUGE, LA.** Selling Fast!!

INSTALLED 1953—OPERATED LESS THAN 30 DAYS

WIDEST VARIETY OF QUALITY EQUIPMENT EVER OFFERED!

REACTORS

1—Leader Iron Works 1000 gal. 316 SS jacketed, agitated, 75# jacket, 25# int.
1—Pfaudler 1000 gal. glass lined, jacketed, agitated, 75# int., 90# jacket.
1—Schaller 750 gal. 316 SS, jacketed, agitated, 25# int., 90# jacket.
1—Schaller 500 gal. 316 SS, jacketed, 90# int., 150# jacket.
3—Schaller 4'x13' 316 SS with 109—3"x6' tubular calandrias, 513 sq.ft. each.

HEAT EXCHANGERS S.S. & NICKEL

3—Pfaudler 390 sq.ft. 316 SS.
3—Struthers Wells 306 sq.ft., nickel.
2—Schaller 93.8 sq.ft., nickel.

KARBATE

5—Alberger 600 sq.ft.
1—Struthers Wells 431 sq.ft.
3—Struthers Wells 370 sq. ft.
1—Falls Industries 360 sq.ft.
1—Struthers Wells 274 sq.ft.
1—Alberger 255 sq.ft.
2—Alberger 159 sq.ft.
7—Alberger 70 sq.ft.
3—Alberger 16.4 sq.ft.

TANKS

1—Colonial 316 SS 5,000 gal. 6'6" dia. x 20' long 25# int.
4—Pfaudler 5000 gal. glass lined 9' dia. x 9'6" long, 35# int.
1—Pfaudler 2300 gal. glass lined 78" dia. x 96", 50# int.
1—Pfaudler 1200 gal. glass lined 66" dia. x 72" high, 50# int.
1—Pfaudler 500 gal. glass lined 4' dia. x 5', 40# int.
1—316 SS., 13,000 gal. Hopper 18' dia. x 4'4" on the straight side with a 9' cone and 5 HP Lightnin agitator.
1—316 SS 7500 gal. Hopper 12'x6' with 5'6" cone.

7—SHARPLES C-27 SUPER-D-HYDRATORS 316 SS vapor tight, timers and switches.

1—I.R. JET REFRIGERATION UNIT 208 tons, at 60°F.

1—I.R. JET REFRIGERATION UNIT 136 tons at 45°F.

1—FOSTER WHEELER 3 MILLION BTU DOWTHERM UNIT 150# design pressure, 866 sq. ft.

1—KEMP INERT GAS PRODUCER 10,000 SCFH, Model 10MID, explosion proof with Model JC-SE2 Dual Tower Absorptive Dryer, 24"x13' spray tower, Fuller Inert Gas Compressor Type C-40.

1—ILLCO DUPLEX ION EXCHANGE NEUTRALIZER two 5'x9' 316 SS tanks, piping, valves and fittings, 182 cu.ft. of Dualite A-7 resin.

3—WESTERN PRECIPITATION "HOLO-FLITE" SCREW CONVEYOR DRYERS 316 SS, 32', 12', 10'.

1—RIETZ "THERMOSCREW" SCREW CONVEYOR DRYER 304 SS, 30', NEW.

2—BUFLOVAK 6'x5'6" MONEL FLAKERS, drums NEW, Reeves drives, 10 HP, XP motors.

1—ALLIS CHALMERS 5'6"x25' ROTARY DRYER 9/16" shell, reducer, Variable Speed Drive, 15 HP motor.

1—PFAUDLER HASTELLOY "C" REACTOR 250 gal., 75# int. 60# jacket.

1—PATTERSON 7'6" CONICAL BLENDER rubber lined, 132 cu.ft. operating cap. 15 HP, XP gearhead motor.

TANKS

1—Steel 30' dia. x 33'2" high, 175,000 gal. cap.
3—Steel Horizontal 24,000 gal. 10' dia. x 40' long, 50# int.
3—Steel 8' dia. x 27'3" long, 9000 gal. cap., 25# int.

CONVEYORS

4—Link Belt Rubber Belt Conveyors fully enclosed 12"x30', 12"x34', 12"x55', 12"x77' long.
2—Link Belt Twin Screw Conveyors, 316 SS. 18"x10', 18"x72'.
2—Link Belt Twin Screw Conveyor, steel 11"x14', 11"x10'.
1—Link Belt Screw Conveyor 6"x12', 304 SS.
1—Link Belt 40'6" c.c. Bucket Elevator buckets and housing of 304 SS.

BLOWERS

3—Sturtevant spark proof Blowers 9500, 11,000 and 17,500 cfm.
3—American Blowers 7900 and 12,000 cfm, motor driven.
1—Buffalo-Forge 640 cfm 7" static pres.
(All driven with XP motors)

PUMPS

11—Karbate Centrifugal
2— 40 gpm 120' head
2— 50 gpm 24' head
7— 60 gpm 60' head
7—Lawrence 316 SS Centrifugal
2— 10 gpm 27' head
1— 60 gpm 208' head
1— 70 gpm 157' head
2—100 gpm 25' head
1—350 gpm 123' head
7—Duriron Centrifugal
4—2½"x1½"
3—1½"x1½"
(All driven with XP motors)

316 Stainless Steel, glass lined and Saran lined pipe, fittings and valves, instruments, explosion proof motors and fixtures, steel buildings.

Details on request ***Your Inspection Invited***

TEXAS OFFICE—4101 San Jacinto St., Houston 4, Texas—Tel.: Locust 1351

BRILL EQUIPMENT COMPANY
2401 THIRD AVENUE, NEW YORK 51, N. Y.
Telephone: CYpress 2-5703 • Cable: Bristen, N. Y.

A SINGLE ITEM OR A COMPLETE PLANT

Write, wire or phone us for complete information — Send us your surplus equipment lists today

Make this call



get "on the ball" with

BRILL EQUIPMENT

IN STOCK AND AT OTHER LOCATIONS

DRYERS

1—Vulcan 8'x125', ¾" shell.
3—Cummer 5'x40', 5'x30'.
1—Vulcan 4½'x50' Rotary Dryer.
1—Link Belt 6'4"x24' steel Roto-Louvre Dryer, Heresite coated, Aerofin coils, blower, drive and motor.
1—Louisville 6'x60' Rotary steam tube Dryer welded shell 125# pressure.
1—Devine #27 double door Vacuum Shelf Dryer with 17—59"x78" shelves.
1—Stokes Vacuum Shelf Dryer #138-H-10 44"x40" shelves.
2—Struthers Wells 5'x15' nickel clad Rotary Vacuum Dryers.
1—Devine 5'x10' steel Rotating Vacuum Dryers.
1—Stokes 30"x8', 3'x15' Rotary Vac.
4—Buflovak Double Drum 32"x100", 36"x84", 32"x72", 32"x52".
1—Buflovak 6' dia. Crystalizer.

FILTERS

3—Oliver Monel 8'x10', 3'x2' Rotary Vacs.
1—Oliver S.S. 8'x6' Rotary Vac.
2—Eimco 8'x8' Rotary Vacs.
2—Sweetland #12 with 72 and 36 leaves.
2—Sweetland #3 all stainless, 12 leaves.
1—Niagara type Horizontal Filter 375 sq.ft. S.S. jacketed.
1—Niagara #140-36 all 316 S.S.
1—Niagara #110-20 with 12 S.S. leaves.
1—Sparkler #33-S-17, steel.
1—Shriver 36" P&F 42 chambers.
4—Shriver 30" P&F 30 chambers.
8—Sperry 24" P&F 16 chambers.
2—Sperry Aluminum 30" and 24" P&F.
1—Sperry 36" P&F, 4 eye, heresite coated.
12—Filter Press Skeletons, all sizes.

CENTRIFUGALS

1—AT&M 42" Suspended, 347 SS.
1—Bird 40" Suspended, 347 SS.
1—Bird 40" Suspended, rubber covered.
2—Tolhurst 40" Suspended, steel.
1—AT&M 36" center slung, rubber covered.
1—Fletcher 30" Suspended, steel.
1—Tolhurst 26" Suspended, steel.
2—Sharples PN Super-D-Canters, 316 SS.
2—Bird 18"x28" Continuous 310 SS.
2—Sharples C-27, C-20 stainless steel Super-D-Hydrators.
2—Sharples #16P Monel and S.S. Super Centrifugess.

PULVERIZERS—CRUSHERS

1—Devine 5'x10' steel, jacketed Mill.
2—Raymond 3 and 5 Roll High Side Mills.
4—Hardinge Mills 4½'x16", 5'x22", 5'x36", 6'x22", 10'x48".
4—Patterson 6'x8', 5'x6', 3'x4' brick-lined Pebble Mills.
1—Patterson 5'x8' porcelain (Berylite) Pebble Mill, 50 HP, NEW.
1—Patterson 4'x4' porcelain lined, jacketed Pebble Mill.
1—Abbe "Eureka" #3 porcelain Jar Mill, 14.7 gals.
1—National 10"x20" two-roll Mill, 25 HP motor.
3—Raymond Gayco Separators 12', 8' and 6'.
2—Mikro Pulverizers #2DH, #1SH.

SCREENS

4—#82 Rotex double deck 40"x120".
1—Patterson single deck 40"x84" S.S.
1—#23 Rotex three deck 20"x80".
4—Tyler Hummer 4'x15', 4'x10', 4'x5' single deck with V-16 Vibrators.

MIXERS

1—Baker Perkins 100 gal. S.S. jacketed, Vacuum Mixer, 75 HP.
2—Baker Perkins 100, 50 gal. Sigma Blades, jacketed.
6—Sprout Waldron S.S. jacketed Powder Mixers, 67, 27 and 10 cu.ft.
1—Struthers Wells 6'x9' S.S. jacketed, Rotary Mixer.
2—Baker Perkins 2 gal., stainless steel.
1—Robinson 4000# steel powder.
6—Rodgers 400 to 3000# powder.
4—Simpson Intensive Mixers #0.
8—NEW Portable Agitators ¼ to 5 HP.
4—Day, Ross 8 and 50 gallon, Pony.

KETTLES—REACTORS—CONDENSERS & TANKS

2—Pfaudler 500 gal. glass lined, jacketed, agitated Reactors.
1—Buflovak 800 gal., 347 SS Clad, jacketed, agitated Reactor.
1—Struthers Wells 750 gal. SS, jacketed, agitated Reactor.
1—Buflovak double effect, Vertical SS Evaporator, 900 sq.ft.
6—Evaporators, single and multi-effect 300 to 14,000 sq.ft.
5—Foster-Wheeler Karbate Heat Exchangers 188 sq.ft., Unused.
9—Heat Exchangers S.S. 50 to 200 sq.ft.
5—Buflovak Condensers 20 to 90 sq.ft.
3—2300 and 1400 gal. Aluminum Tanks.
1—13,000 gal. Horizontal Pressure Tank, ASME, 225# W.P.

MISCELLANEOUS

3—National 10"x20", 6"x12" two-roll Mills.
5—Stokes Vacuum Pumps 10 to 50 cfm.
2—Stokes DD2, D3 Rotary Tablet Machines.
1—Kux Rotary Tablet Press Model 15-25.
10—Nash Pumps TS12, TS8, H8, H7, L3 MD571, #4, #2.
2—Cumberland #0 Rotary Cutters.
14—Olivite, Duriron rubber and stainless steel Centrifugal Pumps 1" to 6".

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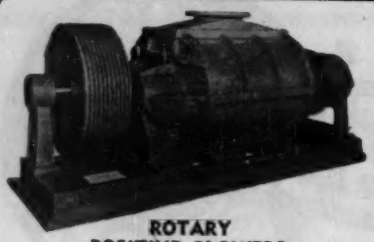
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MAKE	SIZE	TYPE	Max. Press.	Max. CFM
Roots-Conn...	8 x 20	RCR	3.5	955
Sutorbilt.....	18 x 42	XB	4	5320
Roots-Conn...	22 x 36	RCD	5	5500
Roots-Conn...	67	AF	5	164
Roots-Conn...	14 x 36	RCR	5	3580
Roots-Conn...	16 x 24	RCD	5	2515
Roots-Conn...	10 x 18	RCD	6	805
Roots-Conn...	10 x 12	RCS	7	614
Roots-Conn...	76	AF	7	200
Sutorbilt....	5H	Cal.	10	66
Sutorbilt.....	8H	Cal.	10	272
Roots-Conn...	10 x 10	RCR	10	616
Roots-Conn...	24 x 23	RCDH	7.5	8610
Roots-Conn...	32 x 32	RCDH	7.5	14950

Stock List: RP-100



STEEL PLATE EXHAUSTERS

MAKE	SIZE	TYPE	Wheel Diam.	Inlet Diam.
Sturtevant....	100	Des. 3	72¼	38
Sturtevant....	70	Des. 3	49¾	26
American.....	80	ELS	48¼	29¼
American.....	70	ELS	42¼	25¾
American.....	55	ELS	36¼	23
Sturtevant....	50	Des. 3	36	19
New York.....	33	GI	33	21¼
Buffalo.....	45	MW	32	19½
American.....	50	ELS	31	18½
Gen. Blower...	45	MX	27	18¼
American.....	35	E	23	15
Sturtevant....	30	Des. 2	18	11
American.....	3	VRV	13	7
American.....	3	V	12	7

Stock List: MX115

CENTRIGUFAL FANS



MAKE	SIZE	TYPE	Wheel Diam.	Inlet
American.....	11	PH	65¼	73⅛
American.....	9	AHS	53¾	61
Clarage.....	3¾	W	42¼	44
Bayley.....	8		40	41
New York.....	36	ME	36	39¼
Sturtevant....	6	Des. 3	27	27½

Stock List: BC 954

TURBO BLOWERS

Stock No.	Make	Size	HP	Vol.	Press. oz.
1601	General Blower	1630	30	3600	16
1529	Ingersoll Rand	FS377	150	15000	20
2415	Spencer	1515-H	15	1425	24
3220	Spencer	2020	20	1300	32
693	Allen Billmeyer	D-6	7½	275	48
1000	Spencer	Special	200	8200	48

Stock List: TB 155



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- ★ 4—#12 Type D Rotoclone Dust Collectors
- ★ 3—MIH-60 Industrial Gas Heat Fans
- ★ 50—ZEH Buffalo Exhausters (New) with ⅛ HP TE Motors
- ★ 70—American Forward Curve Exhausters Size 1½ with 1½ HP-1750 Rpm Motors
- ★ 1—Spencer Blower—200 HP—8200 cfm @ 48 oz

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6 Stokes and Buflovak and Devine 3-4-6-8 and 17 Shelf single and double door dryers
Sweetland #12 Filter 502 sq. ft. Hydraulic closure
2 40" Stainless steel Centerfuges—link suspended 7½ HP motors
9 new Kingsford Stainless steel 2" Pumps
Shriver 36" x 36" 21 chamber iron 4 eye closed delivery
2 7500 # dry powder mixers
3 Baird 4' x 40' direct heat dryers—1 oil and 2 gas fired
8 Shriver 18" Centerfeed iron Filter presses
3 Bird 40" suspended steel basket centerfuge 40/20 HP motors
1 Ruggles Coles 4' x 30'—complete
1 Buflovak "Monel" 2 effect evaporator
1 Hershey Monel 3' x 24' direct heat
10 Stainless Vacuum pans 80-650 Gal some with agitators
4 Micro Bantam, #1, #2, #4 Mills
15 Porter, Phil, and Netico Agitator Drives ½ to 25 HP
4 Ball & Jewell and Cumberland Rotary Cutters size ½, 1 and 2
Baker Perkins 500 Gal "Unidor" Jacketed Sigma Blade Mixer
Colton #5½ Tablet Machine variable speed drive and 5 HP
5 Tyler Niagara Stainless Steel sifters 2' x 8' and 3' x 8'
4 Pfaudler 500 Gal glass lined and agitated reactors
2 new Karbate Heat Exchangers 25 and 70 sq. ft.
Oliver Pressure Precoat 5'3" x 3' all steel filter
Shriver 18" bronze 41 57.1 sq. ft. filter
Shriver 24" lead filter press 67 sq. ft. and 11 cu. ft. of cake
6 Day 10-20-50-100 Gal double arm mixers
ABBG engineering 90 gal jacketed ball mill with motor
Feinc 5' x 3' "All monel" string discharge filter
4 Louisville 4' x 25'; 4' x 30'; 5' x 35' tubular dryers
1 Buflovak 32" x 52" double drum dryer with 10 HP
American Tool 40" suspended bronze perforated basket 20/10 HP Motor
Devine and Acme steel 1 and 2 effect evaporators
Proctor and Schwartz 2 truck steam dryer
Elmco 4' x 1' Steel Vac filter (closed system)
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2 Blaw Knox jacketed agitated autoclaves high pressure 250 gal.
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12 stainless condensers 10 to 164 sq. ft.
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1—Gruendler 36 x 24 Hammermill

1—J. B. Hammer Mill, 75 HP

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3—Patterson & Abbe 4'6" dia. x 12' cont. Pebble Mills

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1—Bird solid bowl Centrifuge 36" x 50"

8—Muffle Furnaces chrome nickel alloy tubes 24" x 8'6" long

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4—River Water Pumps, 30 HP & 50 HP

2—Fuller Kinyon Pumps, 6"

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2—42" x 120" Double Drum Dryers

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1—Ing. Rand type 20 Air Compressor, 30 HP

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1—Coppus 75 HP Turbine Drive

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2—W & P 100 gal. Sigma Blade Jktd. Mixer

1—Day 10 gal. St. St. Sigma Blade Jktd. Mixer

2—Pebble Mills 6' D x 8' L.

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5'x15' Struthers Wells. 20% nickel clad, Rotary Vacuum, w/500 sq. ft. condenser.
EVAPORATORS—488 sq. ft., Double Effect, SS.
Swenson, Trifle Effect, steel, long tube. 860 sq. ft., 8 pass, Ammonia.
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KILNS—Roto-Louvre 207-10, 310-16, 604-24 steel; 705-20 SS.
16"x12'6" & 3'x24' Monel; 3'x26', 4'x27', 4'x30', 4'x42', 4'6"x50', 5'x44', 5'x50', 5'x67', 8'x125', 9'x80', 10'x50', 10'6"x112'.
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★ Louisville Steam Tube Dryer; 54" x 40' with Cooler 38" x 20'.
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★ Copper 2000 gal. Vacuum Pan; manhole type; coil heated.
★ Zaremba INCONEL Double Effect Evaporator; 60" x 17' and 84" x 15'6".
★ Swenson Quadruple Effect Evaporator; Long Tube Vert. Film Type.
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★ Sprout Waldron 283 cu. ft. Steel Ribbon Mixer; 5' x 10'.
★ Readco 210 gal. Jacketed Heavy Duty Double Ribbon Mixer, 30" x 68".
★ Sprout Waldron Stainless Ribbon Mixer; Continuous Cylinder; 28" x 12'.
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★ Lancaster Mix Mullers; Type EAG3 and EAG4 with accessories.
★ Stainless Steel Bubble Cap Column; 16 sec.; 8⅝" x 19'; complete.
★ Aluminum Column; Bubble Cap; 60 plates; 27½" dia. x 36' high.
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★ Dopp Cast Iron Jacketed and Agitated Kettles; 650 gal.; 61" x 68".
★ Bethlehem Cast Iron Sulphonator; 79" x 74½"; with Coils in Jacket.
★ Orville Simpson Rotex Sifters; 30" x 60"; 60" x 84"; 40" x 120".
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★ Horizontal Lithcote lined Tank; 3500 gal. 6' x 17'.
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★ Shriver & Sperry Aluminum Filter Presses; 12", 18", 30", 36".
★ Shriver & Sperry Stainless Filter Presses; 12" and 18".
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★ A.T.&M. 42" Type 316 Stainless Suspended Centrifugal; 30/15 HP.
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★ Sharples Super-D-Canter Type 316 SS; Model PN 14.
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★ Bird 36" x 50" Centrifugal Filter; Rubber Cov. & S.S.; 40 HP.
★ Bird 18" x 28" Continuous Steel Centrifuge with solid conical bowl.
★ Bird 40" x 60" Continuous Stainless Steel Centrifuge 50 H.P. plus accessories.
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★ Colton Model #5½ Single Punch Tablet Press; 3" x 1½" die; 5 HP.
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1—Abbe Ball Mill, 140 gal., Buhrstone lined
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1—Manton Gaulin Stainless Homogenizer 125 gph
2—I&R Vacuum Pumps, 5 H.P., 60" & 100"
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Davenport Rotary Steam Tube Dryer, 6'x36'
1—Gruendler Hammer Mill, 10 H.P.—New
2—Stainless Steel Steam Jacketed Readco Mixers
1—#316 Stainless Reactor, 265 gals. cap., Jacketed
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1—Patterson Ball Mill, porcelain lined 17"x27"
1—Patterson Ball Mill, 42x36, jacketed
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Hersey 4' x 30' SS Rotary Dryer
56 cu. ft. SS Spiral Mixer, New, 7½ HP mo..

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1—Pfaudler 5 gal. Glass-lined Jacketed Reactor, with Agitator W.P. Jacket 100 psi, Int. 30 psi.



THE GELB GIRL—MARCH 1955

AUTOCLAVES—KETTLES TANKS

1—Alloy Fabricator, 100 gal. Monel Autoclave jacketed and agitated, 200# internal, 100# jacket ASME.
1—Pfaudler Glass lined, Series R, 500 gal. Jacketed Vacuum Reactor, with Impeller Type Agitator and Drive.
1—1600 gal. Type 347 Stainless Steel Storage Tank.
3—Stainless Steel Jacketed, Agitated Vacuum Kettles 650 gal.
1—Struthers Wells Steel Jacketed Vacuum Reactor, 1800 Gals. Cap. with Drive, Turbine Agitator & Coils.
12—Koven Stainless Steel Jacketed Vacuum Kettles, 380 Gals. Cap. Each.
1—Penn. Type 304 Stainless Steel Tank, 3000 gal.

CENTRIFUGALS

1—DeLaval Type 316 Stainless Steel Multi-Matic Centrifuge.
1—Fletcher Stainless Steel Suspended Type Centrifuge, 40" Perforated Basket.
1—A. T. & M. Stainless Steel Susp. Centrifuges, 48" Imperforated Basket.
1—Sharples Type 316 S.S. Super-D Hydrator, Model No. C-20.

COLUMNS

1—Badger, 5' dia. x 23' Copper Column 20 bubble cap trays (New).
1—Struthers Wells, 24" x 30' Nickle Fractionating Tower 60 psi.

DRYERS—KILNS

1—Buflovak 32" x 90" Double Drum Dryer—Complete.
1—Allis Chalmers 28" x 60" Double Drum Dryer.
1—Buflovak Single Door Vacuum Shelf Dryer, 20 shelves.
3—Devine Single Door Vacuum Shelf Dryers, 5-13 shelves.
1—Devine #A Laboratory Vacuum Shelf Dryer with 3 Stainless Steel shelves.

CONDENSERS & HEAT EXCHANGERS

1—Lummus Stainless Steel Heat Exchanger, 360 sq. ft.
1—Struther Wells, Hastelloy "B" Heat Exchanger 480 sq. ft.
1—Colonial Monel 338 sq. ft. Condenser, Shell 50 PSI Tubes 100 PSI ASME.

FILTERS

10—Shriver & Sperry Plate and Frame Filter Presses from 12" to 42".
1—Sweetland #2 Stainless Steel Filter.
2—Feinc Type 316 Stainless Steel 6'6" x 6' Rotary Vacuum String Discharge Filters. Complete. New.
1—Shriver, 36" x 36" cast iron 4-eye closed delivery Filter Press with Hydraulic closing device, 64 chambers.
1—Shriver, 30" x 30" cast iron 4-eye closed delivery Filter Press with 34 chambers.

MIXERS

1—International, Stainless Steel Ribbon Mixer 50 cu. ft. w/drive.
6—Simpson Intensive Mixers #0 and #1.
4—Baker-Perkins Double Arm Jacketed Sigma Blade Mixers, 100 gal. capacity.
1—Day 50 gal. Stainless Steel, jacketed double sigma blade mixer.
4—Pfaudler 50 gal. Glass Lined Jacketed Vacuum Reactors Type ES with Anchor type agitators. Jacket 75 psi.
4—Nooter 1000 gal. Stainless Steel Type 316 Jacketed Reactors, 5'6" dia. x 5'6" ASME 50 PSI INT. 110 PSI Jacket—NEW
1—Steel and Alloy 3' x 15' Heresite lined Rotary Vacuum Dryer, ASME Jacket 60 PSI
1—3' x 12' Stainless Steel Jacketed Rotary Vacuum Dryer
1—Struthers Wells Double Arm "Northmaster" Mixer, 50 Gals. Working Cap., 100 Gals. Total Cap.
1—Lancaster, Stainless Steel Muller Mixer Model LW w/motor.
1—Robinson 17.5 cu. ft. Jacketed Steel Ribbon Powder Mixer.

PULVERIZERS—GRINDERS —MILLS

1—Eppenbach QV-8 Stainless Steel Colloid Mill with motor.
1—Abbe #00 Rotary Cutter with 3 HP Motor.
1—Mikro #2TH Stainless Steel Pulverizer.
1—Mikro #3TH Mikro Pulverizer with 30 HP Motor.
1—Mikro #3W Pulverizer.

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1—Porter 1 hp., 420 RPM.
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1—Lightnin ½ hp., 430 RPM., TEFC.
1—Lightnin 2 hp., 1140 RPM., TEFC.

CENTRIFUGALS & CLARIFIERS

2—DeLaval 84-51, 3 hp. motors.
1—DeLaval SVK54 with 10 hp. motor.
1—DeLaval 84-21 with 5 hp. motor.
1—Tolhurst 32" susp., rubber covered.
1—Tolhurst 18" suspended, st. steel.

DRYERS

1—Porter Devine 2 x 4 vac. drum, 316 s.s.
2—8 x 50' Lacy direct heat.
1—Buffalo Vacuum Shelf, 5 42 x 42" shelves.
1—7' x 80' direct heat.
1—3' x 24' Hardinge direct heat.

FILTERS

Oliver 2½ x 1', iron and steel.
Denver 1 x 3' vacuum rotary.
1—Oliver 3 x 4' phosphur bronze.
1—Oliver 8 x 14' iron and wood.
1—Feinc 10'6" x 16'.
12—Filter Presses: cast iron, alum., wood, from 7" to 30".
7—Internal Pressure—Alsop, Sparkler.

KETTLES

1—Devine 1500 gal. jack., agit.
15—St. Steel jacketed, 20 to 100 gal.
4—St. steel agitated Cookers.

MILLS & PULVERIZERS

Pebble: Abbe porc. lined, 215 gal.
Homoloid: Fitzpatrick mod. J, 3 hp.
3-roll Day 12 x 32, 16 x 40".
Hammer: William BX, 60 hp.
Hammer: Jeffrey 30 x 24 type A, 40 hp.
Hammer: Raymond 16", 7½ hp.
Pulverizer: Micro 2DH, 10 hp. (New).
Pulverizer: Micro 2TH, 15 hp.
Hammer: Gump Bar-Nun, 20 hp.
Pebble: Patterson buhr. lined, 220 gal.
Pebble: Hardinge buhr. lined, 5' x 36".
Imp: Raymond #40, 50 hp.
Colloid: Charlotte 10, st. st., 3 hp.
Colloid: Premier 3" s. st., 7½ hp.
Colloid: Premier U-3, 7½ hp.

MIXERS

4—Baker-Perkins 100 gal. jacketed.
7—Double arm sigma blade 5-100 gal.
14—Single arm sigma blade 30-100 gal.
18—Dry Powder—1½ to 77 cu. ft. cap.
3—Day, Ross 40 gal. pony.
1—Olsen & Tilgner 100 gal. change can.
6—Olsen & Tilgner 100-150 gal. lead-color.

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MIXERS—W & P 50 gal 2 sigma—Ribbon Blenders 600#—Simpson 1½
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EXHAUSTERS—3000 to 30,000 CFM—also Spencer 1200 CFM 16 oz.
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Sperry & Shriver 12" to 36 sq., iron & wood.
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Devine 1000 gal. closed jack. Steel Kettle.
1—2300 gal. vert. agit. Jack. Steel Kettle.
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Patterson 30" x 42", 6' x 5', 5' x 8' Pebble Mills.
Abbe 30" x 30", 30" x 36" Pebble Mills.
Abbe 37" x 30" Chrome-Mang. Ball Mill.
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4—#0000 Raymond Mills.
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2—U. S. & Premier 1½ H.P. Colloid Mills.

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Baker Perkins double arm 100, 50 & 9 gals.
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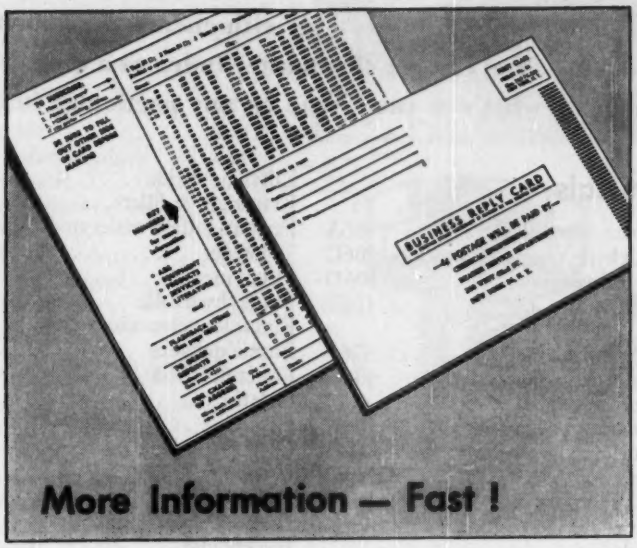
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3,000 gal, S.S. Truck Tanks, Trailerized.
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75 gal. Monel Jkt. Kettle, 35" x 27".
4—50 gal. Steel Kettles, 75# jkt., A.S.M.E.
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20" Centrifugal Extractors, copper baskets.
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What It Contains . . .

Here's your complete index to the chemicals, materials, equipment and services advertised in this issue, announced in the Product News and Process Equipment News departments, or listed in this issue's Guide to Technical Literature within this Reader Service section.

What the Code Means . .

Each item has a code that's the key to its location in this issue. The numerals show the page where you'll find the item mentioned. The letters L (left), R (right), T (top), B (bottom) locate ad positions on the page; the letters a, b, c and A, B, C identify items on a page or in an ad.

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You can get more information on any product listed in this directory by using the Reader Service postcard inside the back cover. Simply circle the item's code number on the postcard, then mail to us. Answers will come to you direct from the companies manufacturing the products.

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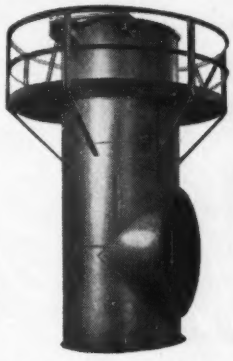
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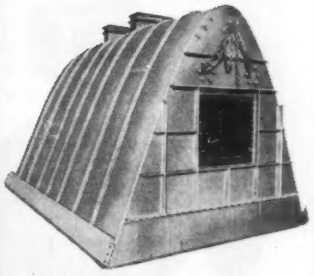

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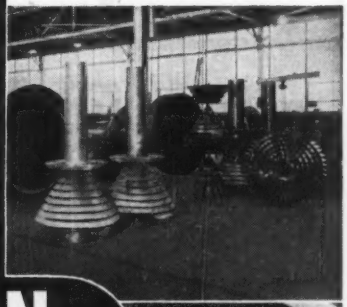

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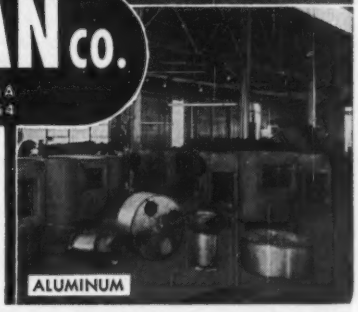
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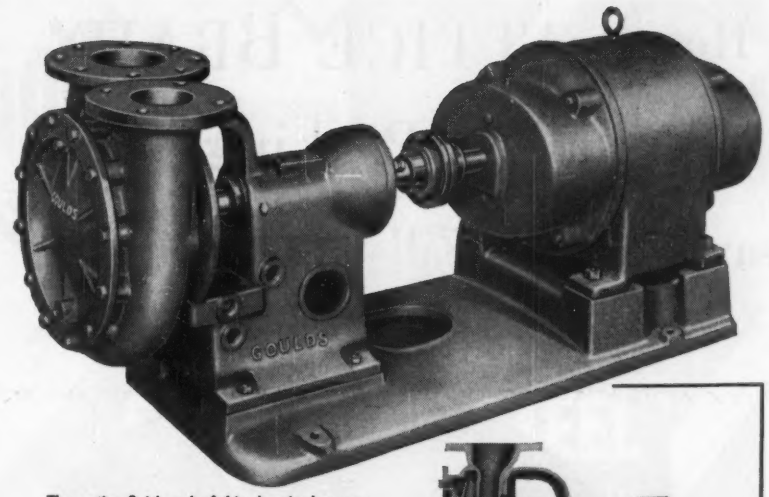
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The entire fluid end of this chemical pump is available in any of the following metals: 316, Gould-A-Loy 20, 304, all iron, all bronze or bronze fitted, all iron with stainless trim. Nine sizes ranging from ¾" to 3"; capacities up to 720 GPM; heads to 200 ft.

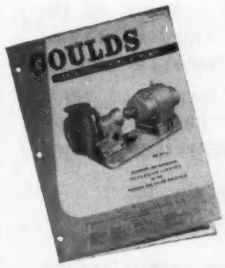
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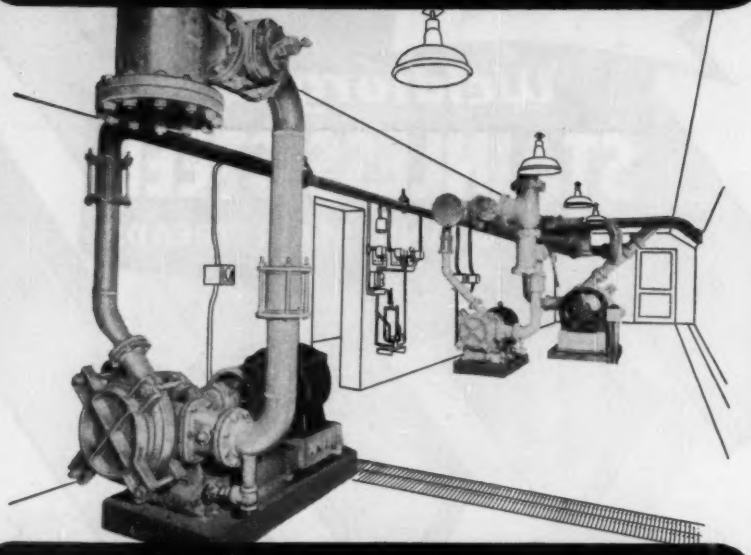
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Heavy viscous slurries with solids ratios as high as 70% by volume are not unusual loads for a Morris Type R Slurry Pump.

A case in point is this Morris installation at the Missouri Portland Cement Co., St. Louis, Mo. The two Morris 3R Pumps in the foreground each handle 200 GPM of a cement slurry at 64% solids with 1.66 specific gravity. Speed is 1180 RPM. The 6R Pump in the background handles 600 GPM of the same slurry at 880 RPM.

Long operating life... little or no maintenance

Massive running parts of the Type R compensate for the increased load imposed by high specific gravities. Hydraulic passages are deliberately designed for high concentrations of solids—the result of careful study of wear patterns shown by pumps in the field handling all kinds of abrasive materials. Elimination of areas of throttling and turbulence assures uniform wear of all parts.

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MORRIS *Centrifugal Pumps*

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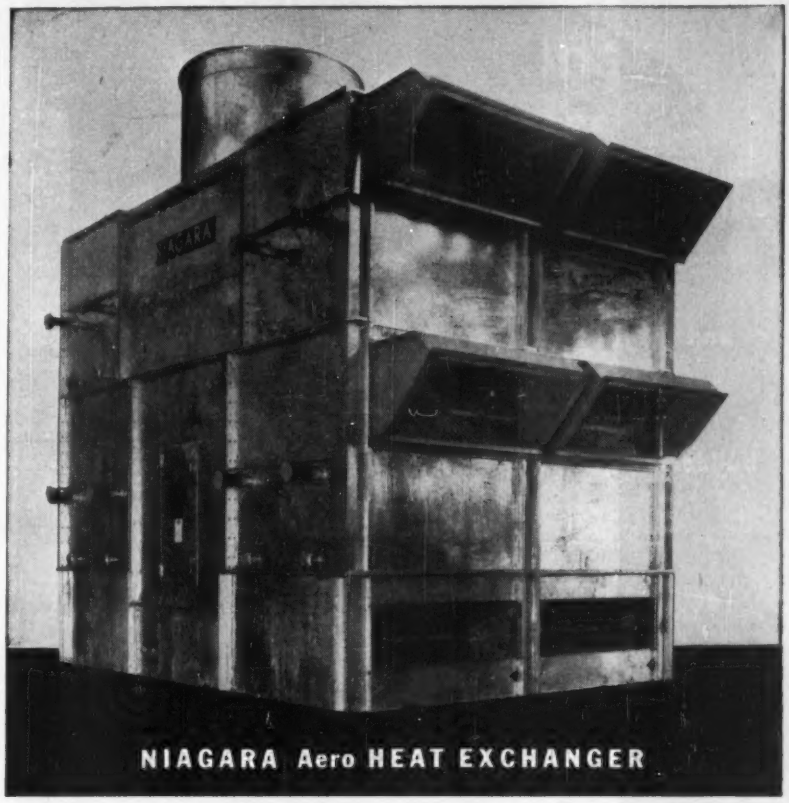
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Flashback

To make sure that you don't miss any news that could help you with your job, Chemical Engineering is doing a double take for you. The index below repeats the editorial listings only on chemicals, equipment and services featured last month in New Equipment and in Chemicals and Raw Materials. Use the postcard (p. 443) for more information on any items.

Chemicals

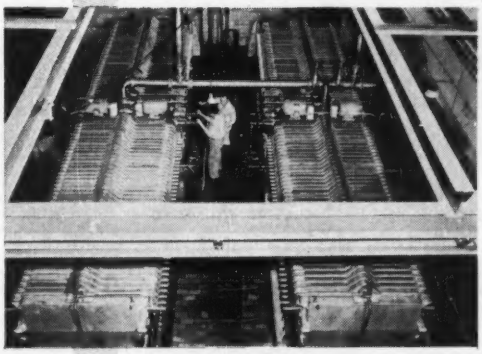
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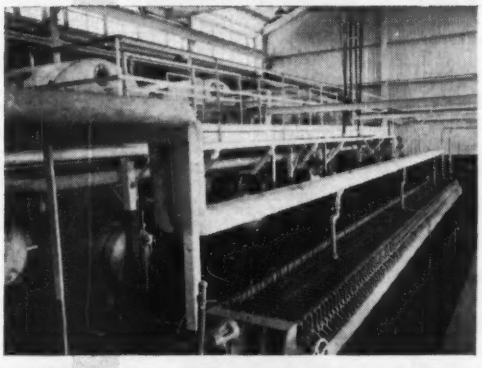
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Filter Presses Offer Many Variations to Improve Processing

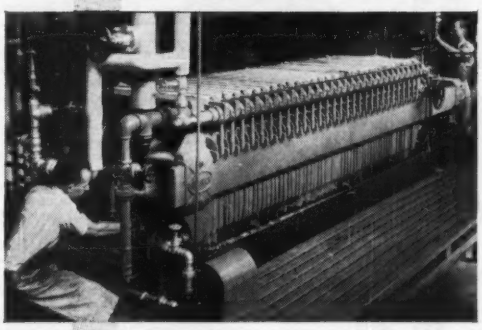
With Shriver filter presses it isn't a matter of just cake recovery or clarification. There are many operations that can be performed in a filter press or in some variation of the filter press design. Here are but three of many examples worth investigating.



These are Shriver brewery mash filters, each double-sectioned, with 40 chambers per section, which can be operated independently. Uniform, thorough extraction of the mash this way saves time, sparge water, labor, fuel and power and improves spent grains and produces drier, sweeter, more saleable filter cake.



This is not a filter press at all but a long, multiple chamber press for cooling and molding wax and similar substances into cakes of uniform size, weight and appearance, without shrinkage.



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Guide to Technical Literature

Want to build up your files and keep them up-to-date? This comprehensive guide to available literature will help you do just that. They're yours—free—for the asking.

What It Contains . . .

This is a comprehensive listing of the latest literature you can now get from manufacturers on chemicals, equipment and services in all fields of interest to chemical engineers. It lists new publications just released, in addition to technical literature mentioned in the advertisements in this issue. The latter are identified by an asterisk (*) alongside the company name.

For More Information . . .

You can get—and get fast—more information on any publication listed in this guide by using the Reader Service postcard inside the back cover. Simply circle the item's code number on the postcard, fill in your name and address, then mail to us. Ask for as many as you need. Answers come to you direct from the companies putting out the literature.

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Chemicals

Absorbers, Ultraviolet.....U.V. Absorber 9 (2-hydroxy-4-methoxy-benzophenone) is unusually effective. It absorbs harmful U.V. & converts it into harmless heat without fluorescence. New Product Bulletin No. 31.
406A American Cyanamid Co.

Acetaldehyde.....A clear, volatile liquid, is one of the most important organic chemicals, having a production rate that is exceeded by few other aliphatics. Properties, specifications, etc. Bulletin S-06-2A.
406B Celanese Corp. of America.

Acetaldehyde.....Eastman acetaldehyde—pharmaceutical raw material... denaturant...chemical intermediate ...etc. Company makes available upon request complete information and product samples.
406C Eastman Chem. Products.

Acetic Anhydride.....A colorless liquid with a very pungent, acetic acid-like odor. Covers physical properties, specifications, uses, hazards, chemical reactions, shipping & handling, etc. in Bulletin N-32-2.
406D Celanese Corp. of America.

Acetone.....New 12 p. reference includes physical and physiological properties, specifications, constant-boiling mixtures, general solvent properties, and resin solubilities. Request Data Folder No. F-8650.
406E Carbide & Carbon Chem.

Acid, Acetic, Glacial.....Includes—physical properties; specifications; hazards; uses; chemical reactions; shipping and handling; storage; materials of construction; etc. Request Product Bulletin S-04-3.
406F Celanese Corp. of America.

Acid, Cyanoacetic.....Cyanoacetic acid is an intermediate for amino acids, barbiturates, dyes, the purine group, vitamins and other drugs. For complete product information request valuable Technical Bulletin
406G Kay-Fries Chem.

Acid, Peracetic.....Bleaching acetate rayon & nylon fabrics with Becco peracetic acid—offers outline of peracetic acid bleaching processes & bleaching formulas as used in textile mills. Bulletin No. 44.
406H Buffalo Electro-Chem. Co.

Acids, Fatty.....Makes available valuable chart, "A Guide to Better Fatty Acids." Technical data on stearic acid, oleic acid, hydrogenated fatty acids, animal fatty acids, vegetable fatty acids, pitches, etc.
406I Wilson-Martin Div.

Acrolein.....Because of the reactivity of their aldehyde and ethylenic groups, acrolein and methacrolein can lead the way to an almost unlimited number of products. Offers complete information and product samples.
406J Carbide & Carbon Chem.

Additives.....Provides data on Lubricin N-1—company's low cost additive. Offers valuable uses as: crank case oil additive; motor fuel additive; cutting oil additive. Includes sample with Technical Bulletin 16.
406K Baker Castor Oil Co.

Alcohol, Polyvinyl.....Elvanol produces tough, grease-resistant films. Films have high tensile strength, impermeability to gases, and resistance to tearing or puncturing. Request literature and information.
406L E. I. du Pont de Nemours.

Alcohol, Polyvinyl.....Rigidly controlled for uniformly high quality. Free-flowing and fast-dissolving—white and non-gelling. A dependable source for quick delivery. Furnishes complete data and product samples.
406M Colton Chem. Co.

Alcohols, Fatty.....Can be used for detergents, chemical specialties, cosmetics, plastics, inks, pulp & paper, etc. Fact Sheet with typical reactions may suggest a way you can use alcohols in your processing.
406N Ethyl Corp.

Ammonia, Anhydrous.....Major supplier of chemical aids to farmers, now produces anhydrous ammonia for direct application to soil, thus providing essential nitrogen at lowest cost per unit. Literature & samples.
406O American Cyanamid Co.

Calcium *Stearate.....A fine, white to slightly yellow-white powder; free from grittiness; slight fatty acid odor. Technical Information Sheet provides details—complete description, uses, containers, etc.
406P Mallinckrodt Chem. Wks.

Carbon Bisulfide.....Precise automatic control assures uniform high-quality, water-white carbon bisulfide for rayon, cellophane, cellulose sponges, rubber and rubber accelerators, etc. Product samples and prices.
406Q Westvaco Chlor-Alkali Div.

Carbon Dioxide.....There's practically no end to the important jobs that CO_2 combined with Liquid Carbonic savvy — is doing. For examples of CO_2's amazingly diversified talents request "Applications Unlimited."
R415 *Liquid Carbonic Corp.

Carburizing Compounds.....Starter clutch mechanisms for the new Martin B-57b bomber are getting a new carburizing treatment. Parts are carburized in new high-speed Aerocarb S & R compounds. Sample & literature.
210-1e *American Cyanamid Co.

Catalyst Supports.....Seventeen compositions...three degrees of porosity... symmetrical or Poly-surface pellets—your pick of catalyst supports. Furnishes technical literature with complete information.
93 *Carborundum Co.

Chemicals.....Announces the availability upon request of a newly revised catalog entitled, "Products of the Dow Chemical Company." Valuable reference furnishes an alphabetical listing of all Dow chemicals.
406R Dow Chem. Co.

Chemicals.....New & completely revised edition of chemical catalogue—data on chemical composition, physical properties & application given on established products & new chemicals released in the past few months.
129a *Antara Chem.

Chemicals, Bulk.....Company announces the publication of their newest chemical supplement, "Bulk Chemicals." Valuable 14 p. price list contains over 100 reagent chemicals now available in bulk. Catalog No. 116-C.
406S Fisher Chem. Mfg. Div.

Chemicals, Organic.....1955 edition of booklet, "Physical Properties of Synthetic Organic Chemicals," now available. Presents the latest data on more than 350 organic chemicals. 24 p. Booklet No. F-6136.
407A Carbide & Carbon Chem.

Chemicals, Peroxygen.....Possibilities of using peroxygen chemicals for dehusking, seed disinfection, improvement of germination & modification of gluten in wheat grain discussed in informative Bulletin No. 33.
407B Buffalo Electro-Chem. Co.

Chemicals, Photographic.....The leader in photographic chemicals—hypo—carbonate—sulfite—and other photo pure chemicals. Company announces the availability upon request of a Folder which describes the Maas line.
407C A. R. Maas Chem. Co.

Chromium Fluoride, Technical.....An especially dry, free-flowing product, offering superior physical characteristics that assure better process performance. Furnishes a product sample and descriptive Data Sheet.
143 *General Chem. Div.

Cold Casting Compounds, Liquid Polymer.....Several trial formulations and properties of cold casting compounds based on "Thiokol" liquid polymer LP-2 are described in 4 p. Technical Service Bulletin 115.
407D Thiokol Chem. Corp.

Cyanuric Chloride.....New plant facilities mean large domestic source of pure cyanuric chloride at a new low price. Offers "Chemistry of Cyanuric Chloride," "Cyanuric Chloride Derivatives" & product sample.
407E American Cyanamid Co.

Defoamers.....Years of research & experience with a variety of foam problems, care in manufacture, & wide selection of raw materials for the job, help produce defoamers that go farther. Offers full information.
407F Swift & Co.

Defoamers.....For more efficient foam control. Versatile defoamers save space now wasted on foam, cut the processing time, eliminate waste & fire hazard of overflowing foam, etc. Offers complete data & samples.
L428 *Dow Corning Corp.

trans-1,2-Dibenzoylethylene.....Contains valuable information on physical properties, chemical properties, suggested uses, physiological action, etc. Includes lengthy bibliography. Technical Bulletin 1-3.
407G National Aniline Div.

1,4-Dichlorobutane.....Now available in tank-car quantities, 1,4-dichlorobutane makes possible profitable commercial development of many organic syntheses. For full details, request literature and information.
407H E. I. du Pont de Nemours.

N,N'-Diphenyl-p-Phenylenediamine..... Explains the use of N,N'-diphenyl-p-phenylenediamine as an effective poultry feed additive for preserving vitamin E & preventing encephalomalacia. Bulletin No. GC-22.
407I B. F. Goodrich Co.

Dispersants.....Describes Marasperse—the low cost, highly effective dispersant. Completely soluble in water; non-hygroscopic, non-fermenting, non-caking, free-flowing powder. Information in File No. W-140.
407J Marathon Corp.

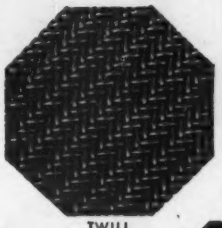
Dispersions, Colloidal.....Company issues a new, completely illustrated reference describing how colloidal dispersions have been used successfully for dry-film lubrication. Request 4 p. Bulletin No. 438.
407K Acheson Colloids Co.

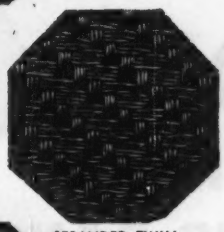
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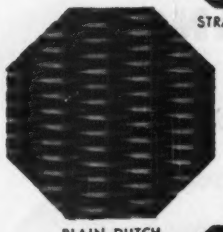
*See explanation on p. 406

Newark Metallic Filter Cloth...

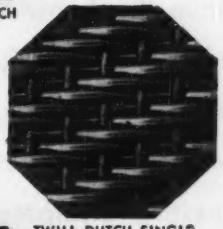


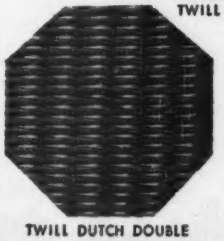

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LITERATURE . . .

Dispersions, Fluorocarbon Polymer.....20 p. covers application techniques for Kel-F fluorocarbon polymer dispersions on metallic and non-metallic surfaces — spraying, spread coating, dip and flow coating, baking.
369 *M. W. Kellogg Co.

Dyes, Vat.....Vat dyes are the best dyes for cotton and viscose rayon fabrics repeatedly exposed to sunlight, salt water, perspiration, rubbing and washing. Request product sample and descriptive literature.
210-1d *American Cyanamid Co.

Epoxidation with H_2O_2.....Literature and data on epoxidation technique for natural fats, oils and derivatives. New method increases epoxy content; lowers by-product formation; eliminates performing peracid; etc.
408A E. I. du Pont de Nemours.

Ethanolamines.....Mono—di—and tri—ethanolamines, scheduled for production, will be capable of meeting the purity demands of the tremendous number of ethanolamine users. Informative technical literature.
408B Allied Chem. & Dye Corp.

Ethyl Acetate.....New 12 p. technical booklet contains information on uses of ethyl acetate & its physical & physiological properties, specifications, shipping data, constant-boiling mixtures. Booklet F-8140.
408C Carbide & Carbon Chem.

Ethylene Oxide.....Used as a starting material in manufacture of acrylonitrile & nonionic surface active agents, & as a sterilizing agent & fumigant. Samples for your preliminary investigation available.
408D Jefferson Chem. Co.

Extenders & Fillers.....Announces Furafil 100 . . . a dependable filler & extender for phenolic resin molding powders & glues, a filler for rubber compositions, an anticaking agent, etc. Sample & Technical Bulletin.
346 *Quaker Oats Co.

Ferrous Sulfate Exsiccated USP Powder.....An odorless, fine, grayish-white powder containing the equivalent of 1¼ molecules of water. Offers a Technical Information Sheet furnishing complete details.
408E Mallinckrodt Chem. Wks

Fluid, Hydraulic.....20 p. booklet includes a step-by-step check list for converting a system to Pydraul F-9 (fire-resistant industrial hydraulic fluid) as well as data on its properties & past performance.
408F Monsanto Chem. Co.

Froth Flotation.....28 p. reference includes sections on: flotation—general discussion; types of flotation reagents; the history of flotation; promoters & modifiers; function of froth in flotation; etc.
408G American Cyanamid Co.

Gelatin.....A high protein, low-calorie food...AA Quality Keystone Gelatin provides a stabilizer and binding colloid for numerous meat, bakery, and confectionery products. Makes available complete details.
408H American Agricultural Chem.

Glycerine.....Offers valuable booklets including "Glycerine—Preferred for Product Conditioning," which outlines properties that make glycerine preferable in conditioning toilet goods and pharmaceuticals.
133 *Glycerine Producers' Assoc.

Hydrogen Peroxide.....Offers a detailed description of properties & uses of Formula D—a grade of hydrogen peroxide designed for the preparation & bottling of dilute hydrogen peroxide solutions. Bulletin 42.
408I Buffalo Electro-Chem. Co.

Isobutyraldehyde.....Offers valuable publication, "The Chemistry of Isobutyraldehyde & its Derivatives." Includes synthesis, physical & chemical properties, applications, handling precautions, etc.
408J Eastman Chem. Products.

*See explanation on p. 406

Latex, Vinyl.....8 p. describes properties, applications, and compounding of latex which is a water dispersion of an internally plasticized polyvinyl chloride type resin. Bulletin L-5, "Geon Latex 652."
408K B. F. Goodrich Chem. Co.

Lignin.....Indulin (pine wood lignin) added to rubber latices acts as an extender in compounds used for paper saturation, adhesives, binders, and film formation. Complete information in Bulletins Nos. 115 and L-6.
409A West Virginia Pulp & Paper.

Lithium Aluminum Hydride.....8 p. covers valuable data: molecular weight; color & form; stability; solubility; chemical reactions—inorganic; chemical reactions—organic; handling & use; etc. Bulletin No. 401.
409B Metal Hydrides.

Lithium Hydride.....Data Sheet offers information covering color and form, density, dissociation pressure, solubility, chemical behavior, applications, availability, purity, handling and storage, etc.
409C Lithium Corp. of America.

Lubricants, Molybdenum Disulfide..... Offers a 4 p. illustrated reference, "Fringe Area Lubrication with Molykote Lubricants," which lists all types of this molybdenum disulfide lubricant. Bulletin No. 103.
409D Alpha Corp.

Molybdic Oxide.....Uses and specifications—furnishes information concerning the uses of molybdic oxide and a complete description of the products available commercially. Request your copy of Bulletin Ch-2.
409E Climax Molybdenum Co.

Neopentyl Glycol.....Potential uses—polymeric plasticizer manufacture; polyester resin manufacture; alkyd resin modifier. Semi-commercial quantities are immediately available. Request complete information.
409F Eastman Chem. Products.

Oils, Essential.....New 36 p. pocket-size Catalog furnishes price & product listings & general item information on the large variety of oils, synthetics, & aromatics manufactured & distributed by D&O.
409G Dodge & Olcott.

Oils, Industrial.....Detailed specifications, shipping data & suggested usage on products of animal, vegetable & marine sources including: oleic acids, red oils, stearic acids, glycerines, etc. 8 p. Bulletin.
409H Swift & Co.

Oils, Solvent.....Include Shingle Stain Oils, neutral extenders for creosote, holder oils for the gas industry and thinners for bituminous paints. Used in many other applications. Offers specifications and samples.
409I Pennsylvania Indus. Chem.

Olefins.....Important properties have opened up great areas for improvement of both quality & economy in large-scale manufacture of rubber chemicals, varnish resins, germicides, etc. Technical Bulletin.
409J Atlantic Refining Co.

Paraffins, Chlorinated.....New, 16 p. technical bulletin, "Chlorowax in Flame Retardant Rubber Compounds," concisely reviews use of two chlorinated paraffins for improving flame retardance of rubber compounds.
409K Diamond Alkali Co.

Peroxide Bleaching.....Reprint of lecture from University of Maine Lecture Series on pulp and paper manufacture. Describes present status of peroxide bleaching of pulps. Bibliography appended. Bulletin 47.
409L Buffalo Electro-Chem. Co.

Polybutenes.....Vistac polybutenes for caulking compounds, adhesives, electronic components, electrical products, rubber compositions, pressure sensitive tapes, etc. Offers Bulletin 114 and product samples.
409M Advance Solvents & Chem.

*See explanation on p. 406

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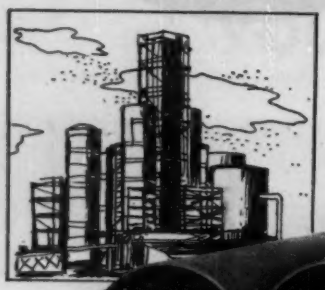
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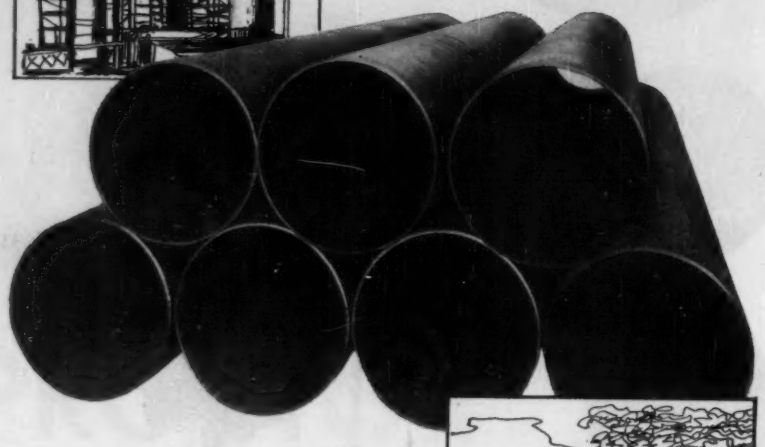
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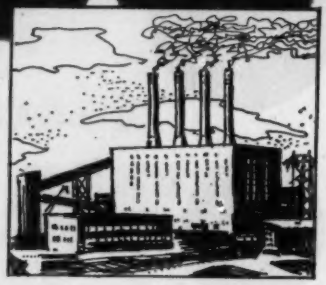
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LITERATURE . . .

Polyethylene.....Makes available descriptive literature and product samples of company's A-C Polyethylene—the low-molecular-weight polymer. Its low viscosity lets you blend with your present equipment.
409N Semet-Solvay Petrochem. Div.

Polyethylene.....New Data Sheet offers complete information on Agilene-HT, irradiated polyethylene...a specially selected grade of polyethylene that is irradiated with highly energized subatomic particles.
410A American Agile Corp.

n-Propyl Acetate.....A medium boiling ester—for: nitrocellulose & other synthetic resins. Physical properties, Celanese specifications, performance in nitrocellulose lacquers, etc. Product Bulletin S-29-4.
410B Celanese Corp. of America.

Resins.....24 p. explains use of Geon Resin 121 in plastisol compounding & gives charts & data on flow properties. Also describes various applications & preparation & fusion of material. Bulletin No. PR-3.
410C B. F. Goodrich Chem. Co.

Resins . . . . . New garbage collection "package system" uses a paper bag made with Melostrength resin which gives paper exceptional strength, wet or dry. Product sample and informative literature supplied on request.
210-1e *American Cyanamid Co.

Resins.....Unplasticized P.V.C. now can be molded for unlimited low-cost, corrosion-resistant applications . . . using Exon 402-A resins. Provides complete details on the many advantages, uses, applications, etc.
410D Firestone Plastics Co.

Resins.....Odorless wall paint with Epon resin. Use your present equipment—open or closed kettles—and produce at competitive prices a superior wall paint. Features and advantages in Technical Bulletin.
410E Shell Chem. Corp.

Resins.....Staybelite's resistance to oxidation, its pale color & lack of odor make it ideal as processing aid for all types of soling & heels. Technical Booklet covers diversified uses in rubber compounding.
410F Hercules Powder Co.

Resins, Epoxy.....Illustrated 16 p. on use of resins for tools, dies, jigs, fixtures, adhesives, laminating, casting, potting, embedding & encapsulating. "Bakelite C-8 Epoxy Resins & Hardeners," No. J-763.
410G Bakelite Co.

Resins, Ion Exchange.....New edition of Nalco Bulletins provide technical data on Nalcite SAR & Nalcite SBR anion exchangers...includes complete up-to-the-minute information on silica removal. Bulletins 57, 58 & 60.
325 *National Aluminate Corp.

Resins, Para Coumarone Indene..... Provides detailed information on line of Piccoumaron para coumarone indene resins. Compatibilities, color and melting point ranges of Piccoumaron included. Bulletin 12-64-4-1-54.
410H Harwick Standard Chem. Co.

Resins, Phenolic.....Issues new bulletin, "Durez Resins in the Rubber Industry." Synthetic rubber latices, solvent-type adhesives & compounding of hard & semi-hard rubber stocks are among the subjects covered.
410I Durez Plastics & Chem.

Resins & Plastics....."1955 Guide to Improved Packaging with Bakelite Plastics & Resins" offers data on Bakelite polyethylene, phenolic, styrene, C-11 & vinyl plastics & resins. 8 p. Booklet No. G-21.
410J Bakelite Co.

Resins, Polyethylene.....Tough, flexible Alathon polyethylene resin stands up well against abrasive slurries. Widely used in industrial pipe applications. Offers complete data on the properties & applications.
73b *E. I. du Pont de Nemours.

*See explanation on p. 406

Resins, Synthetic..... Information on versatile synthetic resin . . . a favorite material in hundreds of industrial plants. Bulletin covers valuable data on features, physical and chemical properties, etc.
410K Pennsylvania Indus. Chem.

Resins, Tetrafluoroethylene.....Teflon tetrafluoroethylene resins used extensively in process industries. Offer chemical inertness, high heat resistance, low-temperature toughness, etc. Properties & applications.
73a *E. I. du Pont de Nemours.

Resins, Vinyl Chloride.....Furnishes physical, electrical, and chemical information on the company's high impact strength vinyl chloride resin as compounded for rigid applications, in Bulletin No. G-13.
411A B. F. Goodrich Chem. Co.

Silicones.....Issues new 1955 Reference Guide listing silicone products and their uses—abhesives; dielectrics; foamed structures; lubricants; protective coating vehicles; release agents; water repellents; etc.
411B Dow Corning Corp.

Soaps, Metallic.....Used in many industries: paint; lacquer & varnish; plastics; rubber; lubricant; etc. Complete data furnished in informative 32 p. reference entitled, "Metallic Soaps for Research & Industry."
411C Metasap Chem. Co.

Soaps, Stannous.....Now available in pilot plant & research quantities is an interesting group of new tin chemicals comprising a wide variety of solvent-free stannous soaps. Offers complete & detailed information.
411D Metal & Thermit Corp.

Sodium Borate.....Latex-base paints and coatings can be made flame-resistant with new FR-28 . . . a readily soluble sodium borate powder. Complete information in Special Bulletin No. 6-F and Data Sheet No. FR-28.
411E Pacific Coast Borax Co.

Sodium Cyanide.....High purity sodium cyanide is available in egg, flake and granular form. Find out how you can profit from using this product in your manufacturing processes. Request literature and information.
411F E. I. du Pont de Nemours.

Sodium Nitrite.....Detailed information on the use of sodium nitrite as an inexpensive and efficient rust and corrosion inhibitor presented in a new booklet, "Sodium Nitrite for Rust and Corrosion Prevention."
145 *Solvay Process Div.

Sodium m-Silicate.....For free-flowing compounds choose Metso Anhydrous. Due to special manufacture, Metso Anhydrous' unique physical structure increases resistance to caking from moisture. Offers product sample.
411G Philadelphia Quartz Co.

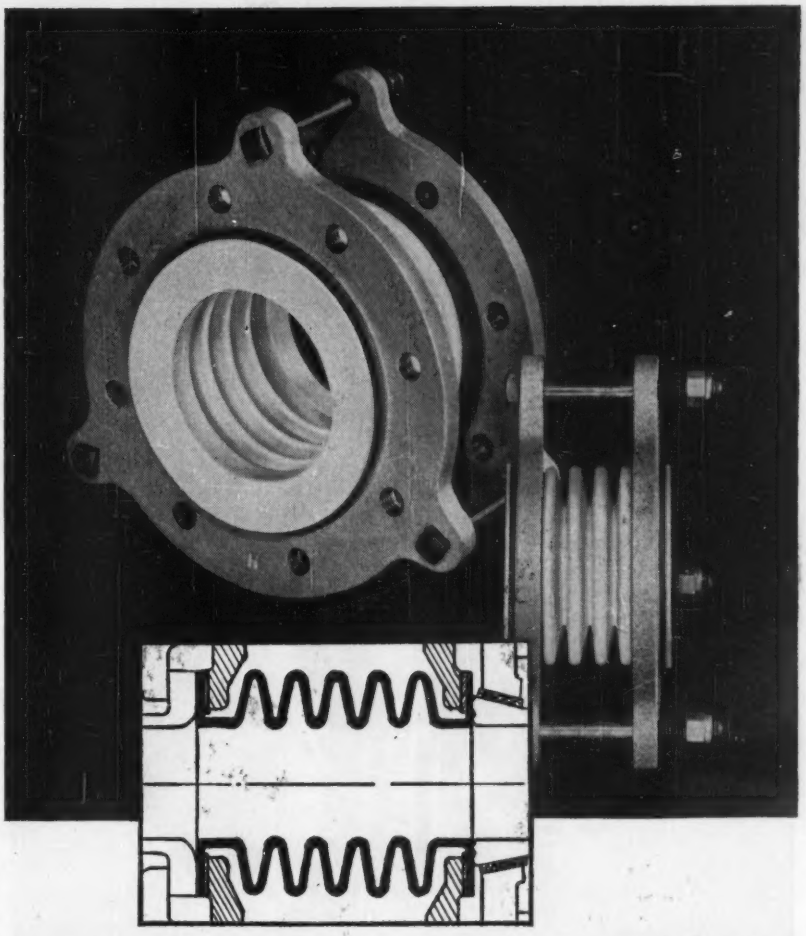
Sodium Tetraborate.....Detailed information on company's Borax, sodium tetraborate—theoretical composition, physical & chemical properties, stability, industrial applications, etc. Technical Bulletin No. 1.
411H Pacific Coast Borax Co.

Sodium Trimethoxyborohydride..... White porous powder, m.p. 230°C., with decomposition. Evolves hydrogen with water. Soluble in organic solvents. For complete information on product, request Bulletin No. 504.
411I Metal Hydrides.

Succinonitrile.....Reactions may be utilized to prepare a variety of bifunctional chemicals which find application in fields of resins, pharmaceuticals, surface active agents, etc. Sample and literature.
210-ib *American Cyanamid Co.

Surface Active Agents.....100%-active nonionic surface-active agents offer over-all balance of desirable properties; ease of formulation, stability, controlled sudsing, etc. Complete technical information.
71 *Wyandotte Chem. Corp.

*See explanation on p. 406



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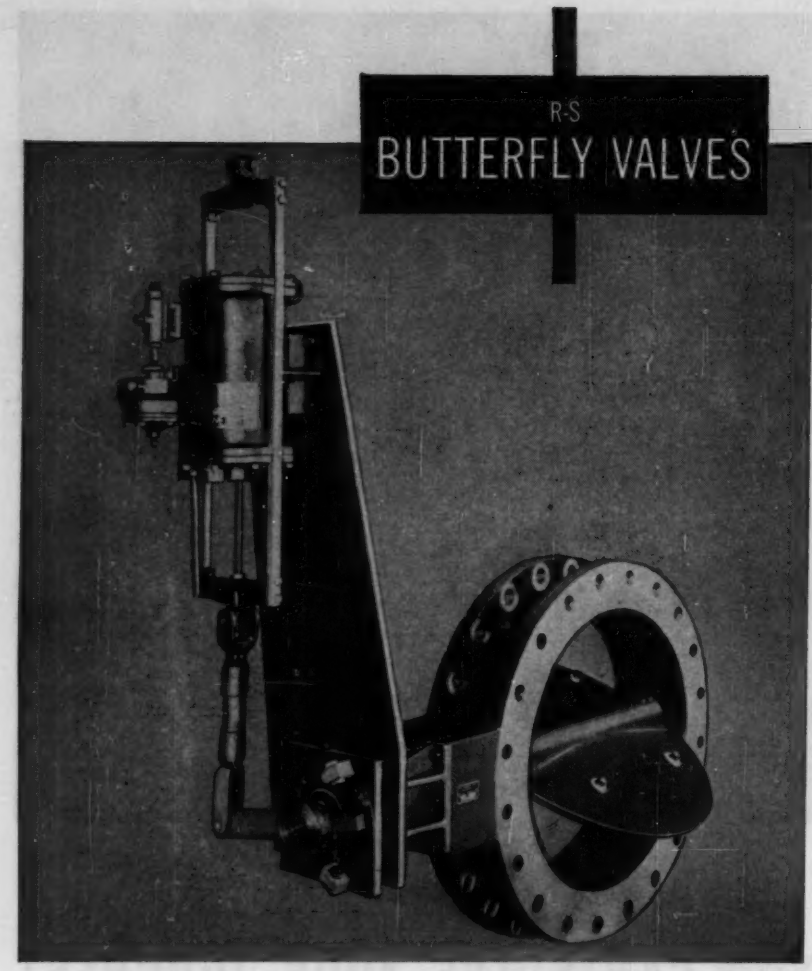
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LITERATURE . . .

Surface Active Agents.....Contains detailed specifications on basic grades of Monamines, as well as chemical, physical & physiological properties on the entire line. Also data on use & compounding. Folder No. 220.
411J Mona Industries.

Surface Active Agents.....Choose Tergitol—powerful surfactants that serve all industry. Non-Ionics (all purpose surfactants)—Anionics (wetting & penetrating surfactants). Detailed technical literature.
412A Carbide & Carbon Chem.

Surface Active Agents.....Information on Croda Cithrol polyglycol esters . . . a range of non-ionic surface active agents. Leaflet contains a complete description in addition to numerous applications. 4 p.
412B Croda, Ltd.

Surface Active Agents.....Cleaning the brush is easier today with paintbrush cleaners containing 5-10% Aerosol C-61 surface active agent. Makes available a valuable product sample plus descriptive literature.
210-1a *American Cyanamid Co.

Vaccines.....A new vaccine, Duovax erysipelas bacterin Lederle, produced by Cyanamid's Lederle Laboratories Division, furnishes effective control of erysipelas in turkeys. Literature and samples available.
412C American Cyanamid Co.

Construction Materials

Alloys.....Versatile special alloys fight wear, corrosion, impact, fatigue; give long life & dependable performance under the severest conditions. Literature on properties & uses in the process industries.
63 *Ampco Metal.

Asbestos.....Blue asbestos features unequalled properties for a wide range of industrial applications—smallest fiber diameter known, resists chemical attack, strongest of all fibers, etc. Bulletin 201.
412D North American Asbestos.

Asbestos.....For your most exacting insulation requirements. Tough—will not crack, crumble, powder. Designed for temperatures up to 1200°. Unaffected by water, vapor, fumes. Fully illustrated Brochure.
85 *Union Asbestos & Rubber Co.

Castings.....Corrosion-resistant castings from created metals . . . to help solve your tough product design problems. Offers 40 years of experience in producing top quality castings. Descriptive literature.
367 *Waukesha Foundry Co.

Castings, High Alloy.....Announces the availability upon request of an interesting series of case histories showing how advance foundry technics have brought new dimensions to the scope of high alloy castings.
367 *Cooper Alloy Corp.

Coatings, Protective.....“ATD” hot spray paint offers maintenance man & corrosion engineer a lower cost, surer way to protect plant & equipment against corrosive attack. Literature describes use & advantages.
100 *U. S. Stoneware Co.

Coatings, Protective.....Phenoline 300 protects concrete . . . under severe corrosive conditions. Furnishes the new Phenoline 300 Series Bulletin, a 4” x 4” sample of troweled Phenoline, corrosion data, etc.
340 *Carboline Co.

Coatings, Protective.....For any equipment or surface that can be uniformly baked....Plastisol compounds offer easy, economical way to apply long-lasting vinyl coating protection. Details in Bulletin No. VP-1.
283 *United Chromium.

*See explanation on p. 406

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LITERATURE . . .

Fabrication, Metal . . . . . Manufactures metal products for many industrial uses . . . from complete carbon-black plants to steel conveyor boxes. Designs, engineers and fabricates to specific requirements.
397 •Boardman Co.

Fabrication, Process Equipment.....If the vessel or component you need is large or small, irregular in shape or unusual in design, Acme's facilities guarantee exact adherence to specifications. Informative Folder.
271 •Acme Welding Div.

Fabrication, Steel & Alloy Plate..... Illustrated 48 p. describes the facilities and workscope of large fabricator—offering the latest techniques in custom fabrication of steel and alloy plate. Catalog 554.
414A Nooter Corp.

Graphite.....20 p. tells about growing significance of graphite in electrometallurgy & electrochemistry, & outlines reasons why Electrode Division has made such steady progress as a supplier. Illustrated.
414B Great Lakes Carbon Corp.

Laminates, Resin-Bonded.....Pla-Tank resin-bonded laminate products for chemical-resistant service in metal finishing & chemical process industries. Data sheets cover tanks, pipe, ducts, hoods, stacks, etc.
414C Chemical Corp.

Steels, Alloy.....Announces a new steel which will enable you to improve the performance, lengthen the life, and reduce the cost of industrial equipment. Descriptive Booklet contains the full story of T-1 steel.
69 •U. S. Steel Corp.

Steels, Clad.....56 p. fully illustrated book furnishes valuable information on stainless clad, nickel clad and monel clad steels. Discusses manufacture, specification, thermal conductivity, corrosion, etc.
414D Colvilles Ltd.

Steels, Stainless . . . . . Covers superior stainless steel sheets, strip, bars, plates, wire, forgings, etc. Data in informative 44 p. booklet, "Making the Most of Stainless Steels in the Chemical Process Industries."
153 •Crucible Steel Co.

Steels, Stainless....."Paper-Thin Stainless for Light, Vital Parts"—a folder with data on Armco stainless steel strip 1½ to 10 thousandths of an inch thick, with gage uniformity right across the strip.
414E Armco Steel Corp.

Steels, Stainless.....Describes porous stainless steel, alloys. Types, performance, and application data for stainless steel and other metals with controlled porosity now available in company's new 45 p. Brochure.
414F Micro Metallic Corp.

Steels, Stainless.....Story of stainless steels in the fiery applications, with suggested procedure for the selection of the right grade. Request illustrated booklet, "Armco Stainless Steels for Heat Resistance."
414G Armco Steel Corp.

Titanium.....Shows resistance to chloride solutions and retains useful strength up to 800-1000F. Other advantages and data on application and fabrication of titanium alloys in descriptive Rem-Cru Review.
154 •Rem-Cru Titanium.

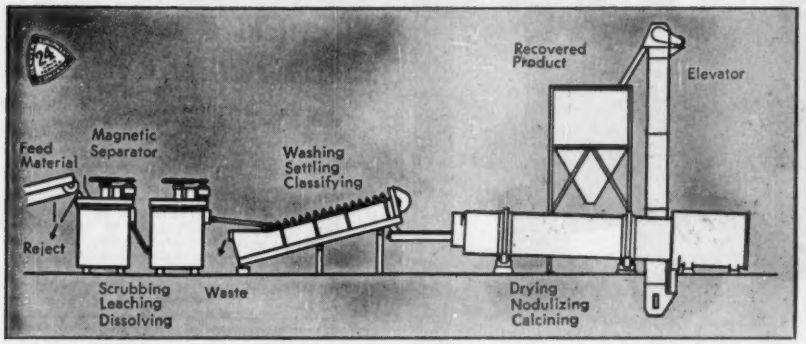
Titanium.....Resists chlorides and other corrosive chemicals as no other structural metal can. Offers general booklet on titanium plus a new technical bulletin with valuable data on corrosion-resistant properties.
93 •E. I. du Pont de Nemours.

•See explanation on p. 406

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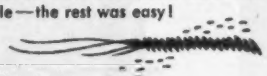
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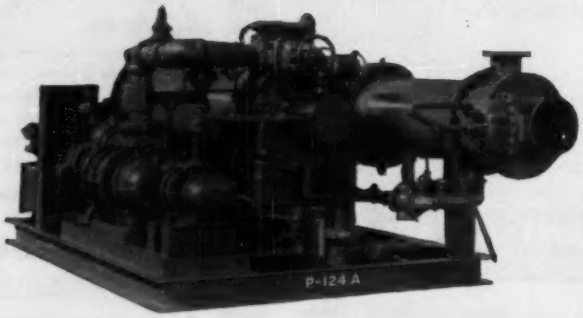
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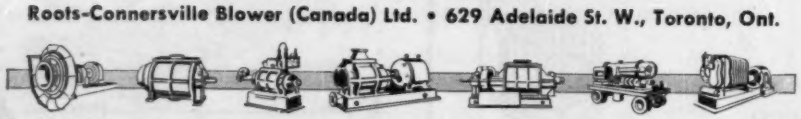
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LITERATURE . . .

Electrical & Mechanical

Batteries, Storage.....Battery selection techniques are emphasized in revised company manual. Deals with storage batteries for stand-by power, emergency lighting and switchgear applications. 20 p. Bulletin No. 210.
416A Electric Storage Battery.

Drives, Fluid.....Available in nine different types, with a wide variety of input, output combinations for any motor or engine installations from ½ to 850 horsepower. Covers full details in Bulletin No. 144-D.
L426 *Twin Disc Clutch Co.

Drives, Multi-V-.....Announces the availability of a new, tabbed 100 p. Manual which presents a scientific and simplified method for rating V-belts. Contains tables, graphs, photos, etc. Book No. V-1400-E2F.
416B Worthington Corp.

Isolators, Shock & Vibration.....Barrymount Type 5200 is a combined shock & vibration isolator used to protect sensitive shipboard & vehicular installations. Vertical natural frequency—20cps. Bulletin 541.
416C Barry Corp.

Motors.....Company announces the availability of their Lubriflush booklet . . . a real refresher course on motor lubrication. Tells all about motor bearing greasing. Includes valuable engineering information.
37 *U. S. Elecl. Motors.

Motors, Chemical.....Corrosion-proof chemical motor with enough flexibility to fit your requirements—it's totally protected. A new booklet, "From Naphtha to Grain Dust," covers the many valuable features.
34 *Reliance Elec. & Engrg. Co.

Motors, Fan Cooled.....Bearing, fully enclosed and protected, yet easy to grease when desired . . . gives more value for your motor dollar. Covers line of totally-enclosed fan-cooled motors in Bulletin No. 51B7225.
52 *Allis-Chalmers Mfg. Co.

Motors, Gear.....Manufacturer can supply gear motors from ½ to 15 hp provided with single, double and triple gear reduction. From ½ to ¾ hp—Bulletin 4-1p21. From 1 to 15 hp—Bulletin 4-1p31.
94 *Century Elec. Co.

Packings, Lattice Braid.....Describes patented lattice braid rod & shaft packings. Points out construction features of lattice braid, & covers available materials, sizes & forms. Illustrated Bulletin No. AD-131.
400 *Garlock Packing Co.

Reducers, Gear.....Units feature precision gearing, all-steel housings, positive lubrication & wide speed range from 1.5 rpm to 1430 rpm with stock gears. Find complete data in illustrated Bulletin No. 3104.
29 *Falk Corp.

Rings, O-.....Fully illustrated, 20 p. describes Garlock O-Rings. Provides complete design information, recommended pressures & available materials for both "dynamic" & "static" applications. Catalog No. AD-148.
416D Garlock Packing Co.

Seals, Mechanical.....Combining chemically impervious teflon with a balanced bellows design—Chemiseal external mechanical seals last longer & give unsurpassed performance. Details in Bulletin No. MS-954.
315 *U. S. Gasket Co.

Speed Change Units.....Designed to fill industry's need for efficient, precision-built standardized line . . . to eliminate high cost & delayed deliveries of specially designed units. 24 p. Catalog CSU-52.
90 *Philadelphia Gear Wks.

*See explanation on p. 406

Switches.....Illustrated 12 p. catalog of Esco Types P & JR rotary, multipole switches contains complete wiring diagrams & contact charts for voltmeter, ammeter & voltmeter-ammeter switches. Catalog 8054-IN.
417A Electro Switch Corp.

Transformers.....Unit substation transformers, both liquid-filled & dry-type, designed to meet distribution requirements. In ratings thru 2000 kva, 15 kv & below. Information contained in Bulletin No. TU-13.
268 *Wagner Elec. Corp.

Turbines, Gas.....Describes combustion gas turbines for power generation & mechanical drive. Gas turbine-steam turbine cycles, mechanical drive applications, design features, etc. Illustrated Bulletin GEA-5516B.
417B General Elec. Co.

Handling & Packaging

Carriers, Straddle.....Completely illustrated 16 p. booklet, "The One-Truck Fleet," uses case-history approach, documented by on-the-job photos, to describe carrier applications in numerous industries.
417C Clark Equipment Co.

Containers, Collapsible.....Fully illustrated, 22 p. describes the new U. S. Seald-Bulk system of handling, shipping and storing . . . based on the 300 cu. ft. U. S. Seald-Bin collapsible container. Bulletin CP-300.
417D U. S. Rubber Co.

Containers, Shipping.....New illustrated Catalog shows the wide variety of G.P.&F. steel shipping containers now available for petroleum, paint and chemical industries. Specifications and carload quantities.
417E Geuder, Paeschke & Frey

Conveying.....Highly automatic, efficient handling system assures minimum labor costs & permits economical bulk purchasing. Describes many economies & advantages of "Airstream" method. Bulletin 529.
50 *Dracco Corp.

Conveyors.....Handle packages, parts, units—faster—at reduced cost with gravity or power roller, belt, slat, chain, wheel or push-bar conveyors. Specifications, drawing & application data in General Catalog.
414 *Sandard Conveyor Co.

Conveyors, Bag.....Furnishes valuable data on Saco sectional bag conveyor . . . a heavy duty unit designed for handling bags, boxes and cartons. Includes features and specifications in illustrated Bulletin 1554.
417F Stephens-Adamson Mfg. Co.

Conveyors, Multi-Tier.....Convert heating, cooling, drying and similar operations from batch to continuous processing. Process products under exact time, temperature and atmospheric control. 8 p. Bulletin.
344 *J. W. Greer Co.

Conveyors, Screw.....Feature efficient operation plus long-life, low maintenance service. Company makes available a 92 p. screw conveyor book of pre-engineered selection and application data. Book No. 2289.
84 *Link-Belt Co.

Formalin Handling.....Revised Manual covers storage, handling, analysis methods, safety precautions, temperature effects, and all other vital information for users of Formalin. Copies available upon request.
62 *Celanese Corp. of America.

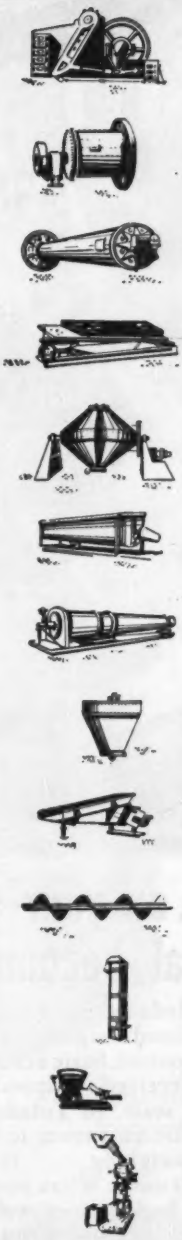
Magnets, Suspended.....Eliminate the hazards of tramp iron . . . with a Dings RM suspended tramp iron magnet. Makes available complete information on the protection afforded by company's product line.
342 *Dings Magnetic Separator.

*See explanation on p. 406

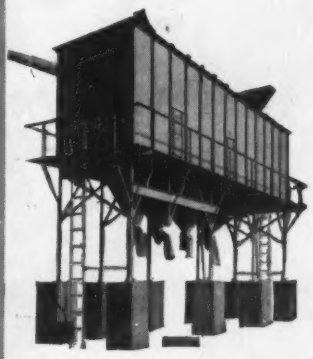
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LITERATURE . . .

Magnets, Suspended.....Rectangular suspended separation magnet cures tramp iron headaches on fast-moving conveyors, particularly when material is wet. Find complete product information in detailed Bulletin 25D.
281 *Stearns Magnetic.

Materials Handling.....Makes available a Brochure describing an exciting new experiment in materials handling teaching techniques—the second annual Material Handling Training Conference. Illustrated, 12 p.
418A Material Handling Training.

Materials Handling, Bulk.....One unit feeds, conveys, elevates thru horizontal, vertical or inclined planes—quickly, efficiently, economically. Request idea book on engineered materials handling systems.
BR345 *Gifford-Wood Co.

Materials Handling, Bulk-Flo.....Equipment designed to reduce handling costs on wide range of materials. Features ability to feed, convey, elevate in one compact, fully enclosed assembly. 28 p. Book 2475.
13 *Link-Belt Co.

Scales, Sacking.....Exact Weight sacking scales . . . sack, weigh, and check . . . in one operation. Simple to operate, have just two controls. Company furnishes complete information on Model No. 2229.
TL349 *Exact Weight Scale Co.

Tanks, Glassed Steel.....New reference furnishes valuable information on Pfaudler Utilitanks . . . the amazing industrial storage tanks that won't rust because they're glassed inside & out. Bulletin No. 916.
448d *Pfaudler Co.

Tractor-Shovels.....Provide important benefits: greater carrying—lifting—digging—bucket capacities; and increased dumping height; a shorter turning radius; improved safety features; etc. Full Model HA data.
259 *Frank G. Hough Co.

Truck Attachments, Fork.....Describes clamping forks with drum up-ender for use with Spacemaster electric fork trucks. Explains what it does, how it works, capacity, construction, etc. Fully illustrated.
418B Lewis-Shepard Products.

Trucks, Drum.....Designed for use with drums which can be drained only in a vertical position. "Rock-a-Drum" picks up heavy drums & rolls them over to reverse up-right position for dispensing. Bulletin No. 949.
418C Morse Mfg. Co.

Unloaders, Box Car.....New type of box car unloader, with automatic power scoop . . . unloads cars on either of two tracks in approximately one-half man-hour per car. Full details in illustrated Bulletin 1654.
418D Stephens-Adamson Mfg. Co.

Heating & Cooling

Boilers, Packaged.....Especially suited to industrial heat processing applications because they're designed & constructed for continuous lifetime service with low maintenance & maximum safety. Bulletin A-104.
329 *Eclipse Fuel Engrg. Co.

Condensate Drainage Control.....C-B system of condensate drainage control—removes condensate, air & non-condensible gases from processing equipment or any condensing medium with jet speed. Publication 6025.
418E Cochrane Corp.

Coolers, Rotary.....Controlled cooling of hot materials with Traylor rotary coolers has enabled numerous processors to greatly increase production efficiency & quality. Bulletin offers complete details.
373a *Traylor Engrg. & Mfg. Co.

*See explanation on p. 406

Generators, Steam.....Company's line of steam generators are available in bent tube types and straight tube forged sectional header types for solid, liquid or gaseous fuels. Descriptive Bulletins available.
280 *Henry Vogt Mach. Co.

Generators, Steam.....Economical and efficient, producing steam for process or heat. Fire-tube models (20-600 b.h.p.) in Catalog No. 622-F. Water-tube models (200-1000 b.h.p.) in Catalog No. 622-W.
R349 *Superior Combustion Ind.

Heat Exchangers.....Describes how heat exchanger applies to controlled temperature cooling of water, oil & other liquids & gases in wide variety of industries, with great cooling water savings. Bulletin 124.
419A Niagara Blower Co.

Heat Exchangers.....Illustrated, 12p. describes precision fabricated heat exchangers for any process industries application—involving gas to gas, liquid to liquid, liquid to gas, powdered solid to solid, etc.
419B M. W. Kellogg Co.

Heat Exchangers.....Pictures and describes company's line of heat exchangers of the shell and tube type . . . for the petroleum and chemical processing industries. Request 8 p. illustrated Bulletin No. HT-40.
419C National Radiator Co.

Heat Exchangers.....Cool liquids & gases by evaporative cooling with atmospheric air, removing the heat at the rate of input, controlling temperature precisely. Details in illustrated Bulletin No. 120.
403 *Niagara Blower Co.

Heat Exchangers.....In De Laval plate heat exchangers the plates are so designed as to produce strong turbulence and high velocity . . . achieving maximum heat transfer. Request Heat Exchanger Bulletin.
231 *De Laval Separator Co.

Heat Exchangers.....Technical data on revolutionary new "holo-flite" (hollow-flight) Processor—continuous-flow heat exchanger that is setting new standards of compactness, adaptability, simplicity. 8 p.
113 *Western Precipitation Corp.

Heat Transfer Apparatus.....Votator heat transfer apparatus can improve efficiency and product quality in numerous processes. Company makes available a Heat Transfer Data Book containing complete information.
2 *Girdler Co.

Heaters.....Rugged industrial heaters available in 24 sizes—8 coil selections—150 ratings from 100,000 to 2,500,000 btu/hr—2000 to 25,000 cfm each. Complete description and advantages available on request.
353 *Westinghouse Elec. Corp.

Heaters.....Handy guide for selecting heating equipment & control. Shows which type of heater to use for specific jobs, how to determine heater rating, how to calculate heat-up time, etc. Bulletin GEA-6146.
419D General Elec. Co.

Heaters, Far-Infrared Radiant.....Far-infrared heat . . . precisely controlled . . . solves problem of baking paint on plastic. Request your copy of reference, "101 Ways to Apply Electric Heat," No. F1550.
290 *Edwin L. Wiegand Co.

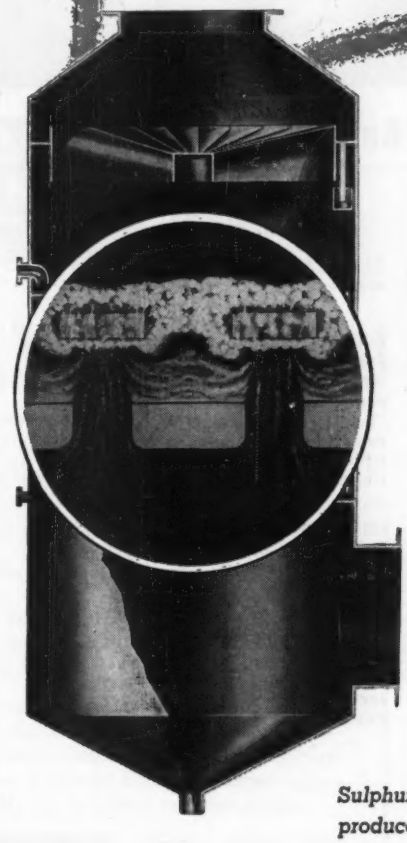
Heaters, Gradiation.....Selas Gradiation Zone Control offers new possibilities in every chemical plant where heat processing is a precise operation. Provides complete information in a new 16 p. Booklet.
282 *Selas Corp. of America.

Heaters, Pipe Line.....Continuous pipe line water heater provides efficient dependable heating in a wide variety of industrial applications. Capacities, sizes, applications, etc. 20 p. illustrated Bulletin 3-A.
419E Schutte & Koerting Co.

*See explanation on p. 406

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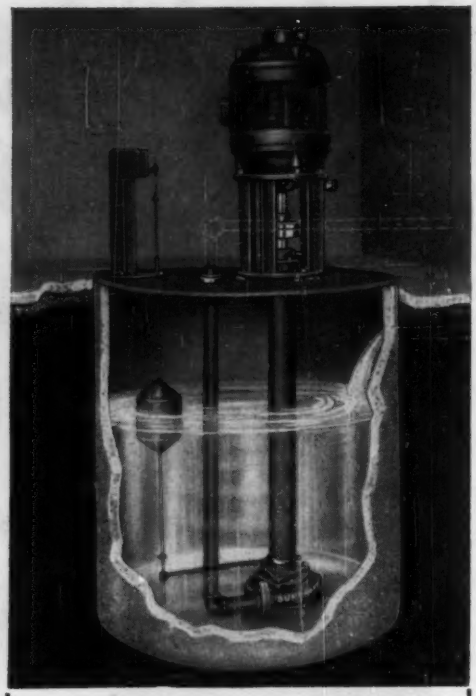
For fast, dependable and efficient solutions to problems involving gas-liquid contact, look to Peabody. Bulletin 203B.

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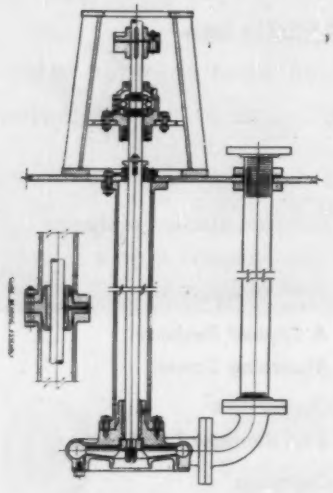
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LITERATURE . . .

Heaters, Thermal Liquid.....Perfected thermal liquid heaters provide temperatures to 750° F for the process industries. Specific features of International-Lamont heaters included in descriptive Bulletin.
420A International Boiler Wks. Co.

Humidity Conditioning.....Presents valuable information concerning Kathabar humidity conditioning . . . which has solved industrial air conditioning problems for twenty years. Request Literature Group K54-2.
285 *Surface Combustion Corp.

Platecoils.....Designed for tank heating and cooling problems due to inefficient pipe coils. These cost-saving platecoils heat or cool 50% faster and take 50% less space in the tank. Offers Bulletin P61.
288 *Tranter Mfg.

Preheaters, Air.....Ljungstrom air preheater makes fuel burn more completely—at a higher temperature—greatly reducing the rate of slag build-up on furnace tubes. Company furnishes full product information.
215 *Air Preheater Corp.

Thermo-Panels.....Cost less and perform better—an improvement on pipe coils. You save space & heat or cool more efficiently. For use in heating & cooling of liquids, slurries, soaps, waxes, etc. Offers Bulletin.
TL347 *Thermo-Panel Div.

Towers, Cooling.....“Engineering Manual for Industrial Cooling Towers” offers basic & complete data on industrial cooling towers of all types. Covers construction, methods of operation, performance data, etc.
420B Marley Co.

Traps, Steam, Impulse.....Serve all normal trapping requirements. Feature many advantages: small size; quick heating; steady temperatures; one moving part; stainless steel construction; etc. Bulletin T-1740.
80a *Yarnall-Waring Co.

Tubes, Heat Exchanger, Aluminum..... Company's new booklet brings you all the facts about the latest developments in aluminum heat exchanger tubes. Profusely illustrated with photographs, charts, and graphs.
295 *Aluminum Co. of America.

Instruments & Controls

Analyzers & Recorders.....The paramagnetic method of measurement is extremely accurate in analyzing industrial gases. Complete information on Magno-Therm O_2 Analyzer & Recorder in Bulletin 52-829-56.
77 *Hays Corp.

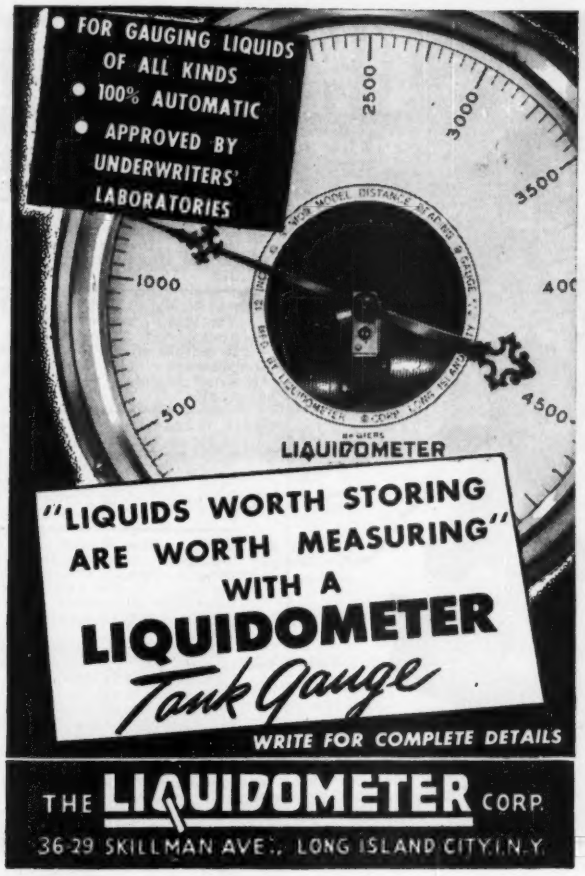
Comparators.....Fully illustrated, 100 p. tells how to use pH and chlorine control for water supplies, process solutions, production processes in 34 basic industries. Also covers complete line of comparators.
R426 *W. A. Taylor & Co.

Control, pH.....Offers suggestions on measurement & control of pH of cooling tower water, & describes equipment for application. Process Data Sheet, “L&N pH Control of Cooling Tower Water,” No. 700(1).
420C Leeds & Northrup Co.

Controllers, Indicating.....Series 540 “On-off” indicating controller . . . is a rugged, durable & accurate remote indicating temperature control instrument designed for general industrial use. Illustrated Bulletin MC 122.
96 *Fenwal, Inc.

Controls, Temperature.....Series 511 remote bulb temperature control is a rugged, durable & accurate device for control of industrial processes involving air, gases & solids. Offers descriptive literature.
420D Fenwal, Inc.

*See explanation on p. 406



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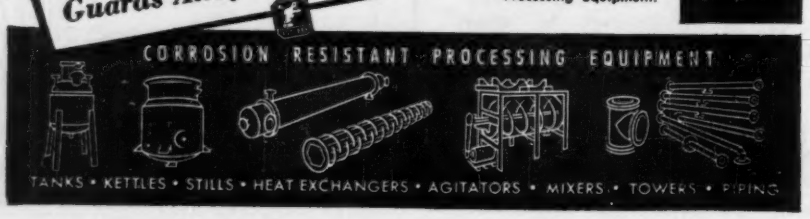
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LITERATURE . . .

Data Processing.....Applications of the NCR computer for electronic data processing, accounting & control. Describes 5 typical business & industrial problems & methods for solving them electronically. 12 p.
422A National Cash Register Co.

Gages.....For pressure, vacuum or compound service. There are no gears or teeth to wear out. Cam wiping action keeps contact points clean & smooth. Provides complete information in Gage Catalog No. G-2.
333 *Helicoid Gage Div.

Gages, Draft.....Diaphragm operated Vertiscale gages feature completely new design in draft gages. Can also be employed for remote indication of pressure, flow, level, etc. Request Publication 52-1060-210.
422B Hays Corp.

Gages, Vacuum.....The Model 517 Alphatron vacuum gage provides accurate measurement over the widest range of any AC-operated vacuum gage. Presents Data Sheets covering complete line of gages and accessories.
377 *Naresco Equipment Corp.

Indicators, Bin Level.....Bin-Dicator bin level indicator for all bulk materials. Signals change in level; automatically starts and stops filling and emptying equipment. Furnishes new detailed Data Book.
TR345 *Bin-Dicator Co.

Indicators, pH.....Furnishes informative literature describing company's new panel-mounted indicator for continuous measurement of pH or redox in manufacturing processes. Illustrated Data Sheet No. ND 42-96(1).
275 *Leeds & Northrup Co.

Instrumentation, Waste Treatment..... New methods of waste treatment aided by ElectroniK instrumentation. Details in Bulletin No. 7302, "Instrumentation for Water, Sewage & Industrial Waste Treatment."
20-1 *Minneapolis-Honeywell.

Instruments, Ring Balance.....Presents reference containing detailed information on the application of Hagan ring balance instruments to problem of precise proportional chemical feeding. Bulletin No. MSA 102.
81 *Hagan Corp.

Ozonators, Laboratory.....Are designed as precision laboratory instruments capable of constant and reproducible operation, positively safe to use. Find complete details on the Model T-23 in descriptive Folder.
209b *Welsbach Corp.

Power Operators.....Illustrates versatility of Cylinder Conomotor & its many applications including proportional control of speed changers, valves, pumps & electrical components in new 12 p. Bulletin B-50-2.
422C Conoflow Corp.

Proportioning, Automatic.....Furnishes information on Richardson's automatic proportioning systems. For complete case history file of Select-O-Weigh installations in industry, request Bulletin No. 0351.
66 *Richardson Scale Co.

Recorders.....Offer valuable advantages: inkless recording (by heated stylus) on plastic coated strip chart paper, & in true rectangular coordinates; high torque galvanometer movement; etc. "150" equipment Catalog.
233 *Sanborn Co.

Recorders, Temperature.....Newly designed Model "1000" Auto-Lite recorder gives permanent proof of temperature behavior. Request valuable catalog describing the many styles of recorders and indicators.
T337 *Electric Auto-Lite Co.

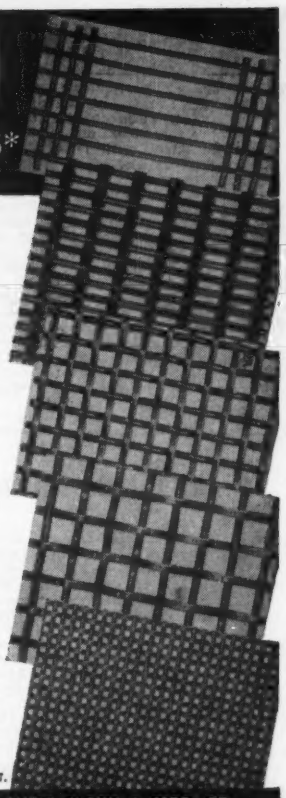
Telemetering.....Introduces remote transmission systems for water, sewage & process plant uses. Defines telemetering, basic types of telemetering equipment & describes advantages & benefits. Bulletin 9100.
422D Automatic Control Co.

*See explanation on p. 406

CLEVELAND

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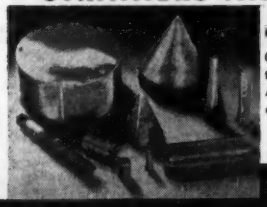
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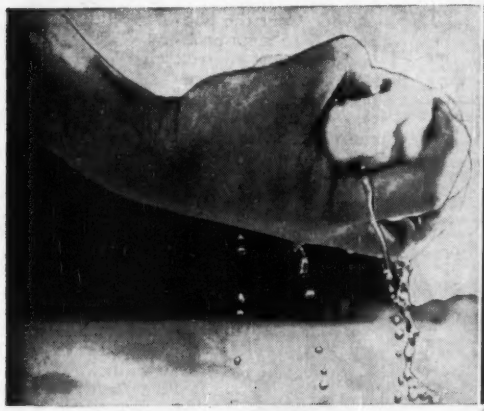
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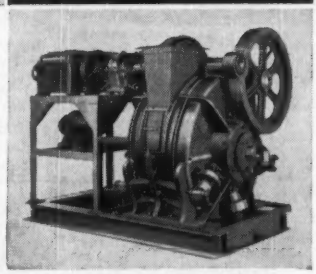
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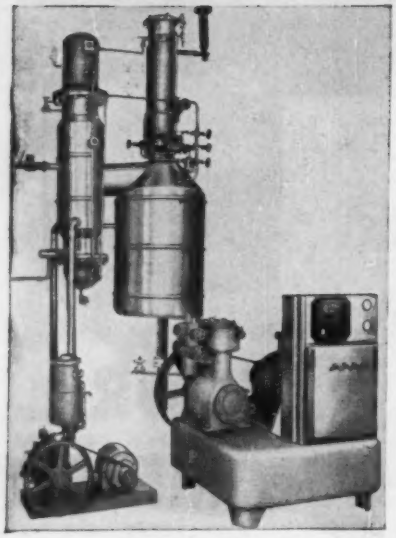
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LITERATURE . . .

Telemetering.....Telemeter system developed to satisfy demand for a more accurate, reliable, simple system of remote measurement. Features, operation, specifications, etc. in 8 p. illustrated Bulletin 17-11.
424A Foxboro Co.

Testers, Thickness.....Audigage ultrasonic thickness tester offers many features: measures from one side; wide thickness range; portable—battery operated; non-destructive; etc. Details in illustrated, 6 p.
424B Branson Instruments.

Viscometers.....Built by Swiss craftsmen . . . to operate in a vessel—bypass—pipeline . . . at extremes of pressure—viscosity—temperature. For complete information request 8 p. fully illustrated Bulletin.
424C Drage Products.

Pipe, Fittings, Valves

Fittings, Pipe.....Presents newest catalogue of stainless steel pipe fittings which shows all standard pipe fittings and flanges, flanged fittings, butt weld fittings, etc. Request illustrated Catalog 653.
424D Camco Products.

Fittings, Pipe, Polyvinyl Chloride..... New illustrated Bulletin provides valuable information on injection molded unplasticized polyvinyl chloride pipe fittings and flanges. Includes features and properties.
424E Tube Turns Plastics.

Flange Specifications.....Company announces the development of a new Flange Specification table for ASA and MSS Flanges in a convenient, slide rule form. Pocket-size reference is available upon request.
424F Camco Products.

Joints & Couplings.....Teflon expansion joints and flexible couplings absorb shock, vibration, thermal expansion and contraction. Connect unlike piping ends and nozzles. Covers complete data in Bulletin FC-952.
335 *U. S. Gasket Co.

Nozzles, Spray.....Company provides a 48 p. industrial catalog with full data on thousands of standard and special nozzles—for every type of spraying. Also information on related equipment. Catalog No. 24.
TL381 *Spraying Systems Co.

Pipe & Fittings, Glass.....Glass pipe & fittings for full-scale production operations. Strengthened by end-tempering & feature corrosion-resistance, non-contamination, etc. Catalogs EA-1 & EA-3 offer full details.
22-3a *Corning Glass Wks.

Pipe & Fittings, Polyvinyl Chloride..... Furnishes details on ½" to 4" line of normal impact & high impact unplasticized polyvinyl chloride pipe & fittings, plus properties & characteristics data, etc. 12 p.
424G Alpha Plastics.

Pipe, Fittings & Valves, Plastic..... Complete technical data on Dur-Ace . . . new general-purpose corrosion-resistant plastic pipe with exceptional impact strength & toughness. Illustrated Bulletin 80-A.
424H American Hard Rubber Co.

Pipe Installation, Glass.....Pipe is easy to install & low in installed cost compared with other corrosion-resistant materials. Available in 6 standard sizes from 1- to 6-inch. I. D. inclusive. Installation Manual No. PE-3.
22-3b *Corning Glass Wks.

Piping, Copper.....The special advantages of copper piping: costs less to install & maintain; joins quickly; handles easily; won't rust; needs fewer fittings; bends to clear obstructions. Publication No. B-1.
43 *American Brass Co.

*See explanation on p. 406

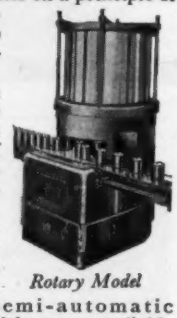


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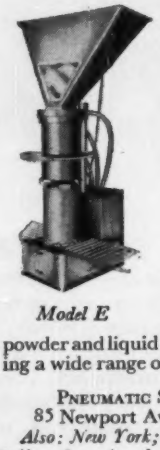
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LITERATURE . . .

Tubing, Mechanical, Stainless Steel..... Outlines the numerous advantages offered to design & fabrication engineers who consider tubing in the production of parts & products which they manufacture. Folder TB-365.
425A Babcock & Wilcox Co.

Tubing & Pipe, Stainless Steel.....32 p. illustrated "Corrosion Control" reference covers: types of corrosion; corrosion-resistance applications; selecting tubing & pipe for corrosion-resistant service; etc.
425B Carpenter Steel Co.

Tubing, Stainless Steel.....Furnishes engineering information on construction and types of flexible stainless steel tubing. Also includes data on fittings. Request this completely illustrated Bulletin No. STC-1.
47 *American Brass Co.

Tubing, Stainless Steel.....Offers economical, trouble-free service over long periods of use. New Trentweld price calculator gives full price information and weight per foot of tubing size and grade you need.
117 *Trent Tube Co.

Tubing, Titanium.....Furnishes up-to-date information on fabrication of unalloyed titanium tubing. Subjects covered include heat treating, pickling, welding, brazing & machining. Illustrated Bulletin No. 43.
425C Superior Tube Co.

Unions, Stainless Steel.....Comprehensive illustrated literature on stainless steel unions specifically designed and constructed for top performance on all metering, measuring and flow control services.
TR429 *Clayton Mark & Co.

Valves.....28 p. catalog contains dimensions and illustrations describing latest Rockwell-built valves. Included are non-return (stop-check) valves, globe and angle stop valves, etc. Condensed Catalog No. 105.
425D Edward Valves.

Valves.....Describes Type 555-RO four-way hydraulic operating valve . . . a unique rotor actuating hydraulic valve with full floating position. Designed for 300-1500 psi pressures. Details in Bulletin No. S-600.
155 *A. W. Cash Co.

Valves.....Versatile, dependable, economically-priced hand valve . . . for corrosion, abrasion, vacuum or general service—wherever positive action is needed. Details of X-V Series in Bulletin No. FL-154.
136-7a *Farris Flexible Valve Corp.

Valves.....For heavy duty or special duty, valves give accurate control & long life. Standard line includes: abrasion resistant, gate, motorized gate, cock, quick opening, butterfly, etc. Descriptive Bulletins.
404a *McNally Pittsburg Mfg.

Valves, Diaphragm, Packless.....Eliminate stem leakage and maintenance on air, vacuum, gas, light oil and similar services. Available in wide selection of materials and sizes. Request Folder No. AD-1942.
309 *Crane Co.

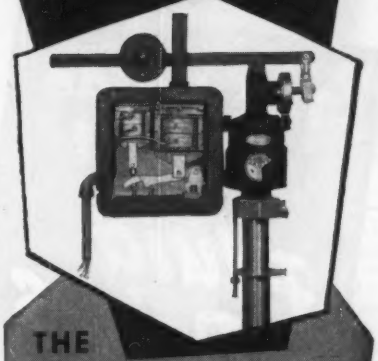
Valves, Gate.....Offers data on sturdy, small forged steel gate valves. Superhardened gate and seats assure tight closure, smooth operation and low maintenance. Complete information in Catalog No. 10.
297 *Chapman Valve Mfg. Co.

Valves, Globe.....The modern OIC "500 Line" provides a choice of 3 bronze globe valve designs to meet specific sets of operating conditions. Find complete information on company line in descriptive Form No. 1001.
48 *Ohio Injector Co.

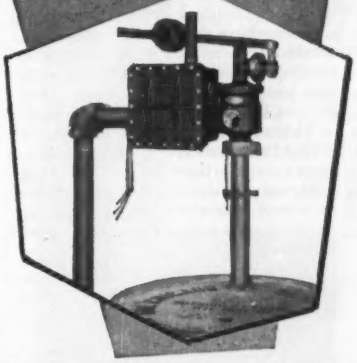
Valves & Fittings, Polyvinyl Chloride.....Line designed & engineered by Lunkenheimer—patented & registered under "Luncor", which refers to its remarkable resistance to corrosive chemical action. Complete data.
425E Lunkenheimer Co.

*See explanation on p. 406

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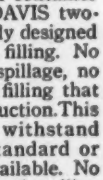


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LITERATURE . . .

Valves, Lubricated Plug.....Cover variety of services for gasoline, oil, water, air, gas, acids, chemicals, etc. Includes characteristics of design, special features & types, in 44 p. illustrated Catalog No. 5.
251 *ACF Industries.

Valves, Packless.....For use wherever pipelines carrying gasoline, oil or other volatile liquids & vapors must have positive protection against leakage. For complete information request Bulletin No. EC-813.
316 *Fulton Sylphon Div.

Valves, Pinch-Type.....No other valve controls flow of hard-to-handle corrosive & abrasive materials with efficiency & reliability of pinch-type valve . . . because Flex-Valve cannot plug. Catalog No. FL-382.
136-7b *Farris Flexible Valve Corp.

Valves, Plug.....Company's line of nonlubricated steel plug valves features dependable performance at a wide range of temperatures and pressures. For complete details, request informative Wedgeplug Catalog.
99 *Wedgeplug Valve Co.

Valve, Plug.....Regrind-renew plug type valves with 500 Brinell armor seat—armored against valve-killing close control of steam . . . and abrasion. For complete information on company line, request Form No. 202.
45 *Jenkins Bros.

Valves, Safety Relief.....Peak performance . . . positive valve action assured . . . even where discharge lines are long, or low "superimposed" back pressure exists in relieving system. Request Catalog No. 1900.
16-7 **Manning, Maxwell & Moore.

Valves, Shut-Off.....Pertinent information offered for shut-off valves which are actuated by either: excess flow; solenoid; heat, of any predetermined degree; shock. Includes operation, uses, ratings, etc.
426A McRae Corp.

Valves, Solenoid.....A new automatic valve to solve your tank or drum filling problems . . . the Davis No. 97th solenoid valve saves time—avoids waste—promotes safety. Provides descriptive literature.
R425 *Davis Regulator Co.

Process Equipment

Autoclaves, High Pressure.....Ideally suited for many "small batch" laboratory research problems in high pressure investigations. Covers features, applications, sizes, etc. in illustrated Bulletin No. 1051-A.
426B Autoclave Engrs.

Centrifugals.....Centrifugals with "all-speed" drive are used to determine best centrifuging speeds . . . can help to lower manufacturing costs & increase production. Illustrated Catalogs offer complete details.
308 *Tolhurst Centrifugals.

Centrifuges.....Many conventional separating & clarifying problems are improved vastly & many difficult problems are now being solved economically thru widespread use of Super centrifuges. Bulletin 1248.
121 *Sharples Corp.

Classifiers, Air.....New Gyrotor air classifier is a separator designed for close control of products. Has a wide range of fineness, controlled by simply changing the rotor speed. Data in Bulletin AH-449-11.
326b *Hardinge Co.

Crushers.....S-A Knittel ring-type crushers reduce mine-run coal to stoker size in one operation. Double-rotor unit handles wet coal without clogging . . . maintains full rated capacity. Offers Bulletin 12-C.
426C Stephens-Adamson Mfg. Co.

*See explanation on p. 406

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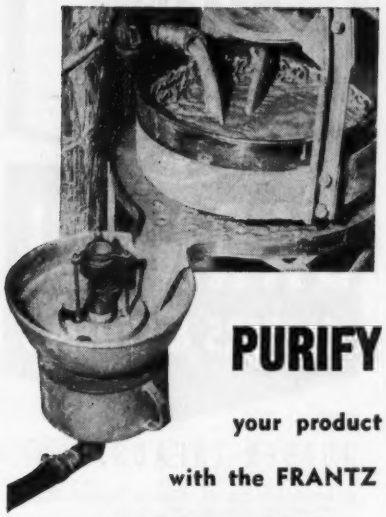
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LITERATURE . . .

Crushers, Jaw.....Issues an illustrated booklet describing company line of jaw crushers built in many sizes & types for various requirements. Specifications & approximate capacities, hp & weights. Bulletin No. 062.
427A Sturtevant Mill Co.

Crushers, Rotary.....Rotary fine crushers are unique in that they crush or granulate to fine even sizes without producing a large amount of "fines" or dust. Includes data on operation & specifications. Bulletin 063.
427B Sturtevant Mill Co.

Deaerators.....Tray type—prevent corrosion in piping, economizers, boilers & exchangers by removing dissolved oxygen & other non-condensible gases. For complete details, request Publication No. 3005.
427C Cochrane Corp.

Deaerators.....Modern design, a simplified principle & advanced engineering now bring effective deaeration at a budget price. Describes advantages, operation, capacities, applications, etc. Bulletin No. 1300.
427D Fred H. Schaub Engrg. Co.

Deaerators.....Atomizing tray—recommended for heating & deaerating waters when operating under constant pressure application & where atomizing type is not thermally disadvantageous. Publication No. 4635.
427E Cochrane Corp.

Deaerators, Reboiling.....Outlines the numerous advantages of the reboiling deaerator with direct contact internal vent condenser, which heats and deaerates water in three stages. 4 p. illustrated Bulletin No. 3677.
427F Permutit Corp.

Deaerators, Steam-Jet.....Covers full-contact steam-jet deaerators—design improvement, ranges of application, performance characteristics, principles of operation & construction. Bulletin No. W-210-B-32.
427G Worthington Corp.

Dissociators, Ammonia.....Illustrated, 12 p. offers valuable information: typical uses of dissociated ammonia; description of dissociator; economy; advantages; sizes-capacities; users of equipment; etc. Bulletin B-52.
40 *Drever Co.

Dryers.....Lectro-dryers can dry air & gases in volume to dewpoints below —100°F—can drop relative humidity lower than 10%. Booklet describes machines & how various industries use them to gain efficiency.
279 *Pittsburgh Lectrodryer Corp.

Dryers, Rotary.....Deliver top production, exacting performance, greater profits. Tells how Standard-Hersey has aided manufacturers throughout the world in solving their dryer problems, in illustrated, 12 p.
300 *Standard Steel Corp.

Dryers, Rotary, Vacuum.....Buflovak vacuum rotary dryers provide low temperature drying with agitation . . . and recovery of solvents. For complete data on company's line request illustrated Catalog 341.
53 *Buflovak Equipment Div.

Drying Equipment.....To improve your product call on Proctor & Schwartz, who not only manufacture drying equipment, but have the know-how to help you in materials handling problems. Request Bulletin 390.
408 *Proctor & Schwartz.

*See explanation on p. 406

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LITERATURE . . .

Drying, Vacuum.....Company offers informative brochure, "Vacuum Drying," which contains descriptions of the techniques of moisture removal from chemicals, pharmaceuticals and other industrial products.
289 *F. J. Stokes Mach. Co.

Dust Collectors.....In almost every type of industry . . . users have found high efficiency, simplicity & economy of Dustube collectors a difficult combination to equal for top performance. Catalog No. 372.
28 *American Wheelabrator.

Dust Control.....Pangborn engineers help solve your dust problems—line of wet or dry dust collectors can save time, trouble & money. See how varied industries are benefited in "Out of the Realm of Dust."
317 *Pangborn Corp.

Dust Control.....Pioneers and leaders in industrial dust control for all process operations—crushing, screening, milling, grinding, blending, mixing, drying, etc. Full data on flat bag dust filters in Bulletin 98.
417 *W. W. Sly Mfg. Co.

Dust Filters.....Help solve dust control problems. Describes the numerous advantages of using the Day line of high pressure reverse jet filters . . . for efficient dust control. Illustrated Bulletin No. 528-R.
147 *Day Co.

Filter Fabrics.....The right fabric adds efficiency to continuous operation. Announces availability of a fully illustrated booklet, "Filter Fabric Facts," describing filter fabric development and application.
82 *Wellington Sears.

Filters.....Handle wide ranges of fluids at wide ranges of flow rates and viscosities . . . capacities from a few to over 800 gpm . . . connections from ¾ in. IPS to 6 in. flanged. Request Micro-Klean Bulletin.
57 *Cuno Engrg. Corp.

Filters, Rotary Vacuum.....Covers design features . . . for handling both slow filtering & free filtering solids; how it discharges thin cake by pneumatic blow-back, & utilizes thorough counter-current wash.
11 *Bird Mach. Co.

Gas Dispersion.....Describes the Autoclave Dispersimax . . . for maximum gas dispersion. Covers function, advantages, design & operating principles, performance, sizes, etc. in illustrated Bulletin No. 1254.
428A Autoclave Engrs.

Jet Apparatus.....Includes basic information on jet principle, jet apparatus terminology, and data on jet construction, operation, and advantages offered by jet apparatus. 12 p. illustrated Bulletin No. J-1.
91 *Schutte & Koerting Co.

Kilns, Rotary.....Every part is precision designed, precision built to give you maximum protection against mechanical troubles of all kinds. Offers complete information in illustrated Bulletin No. A-422.
278a *Vulcan Iron Wks.

Laboratory Machines.....Company provides valuable data on their line of equipment—laboratory crushers, laboratory crushing rolls, laboratory sample grinders, laboratory swing-sledge mills, etc. Bulletin 067.
428B Sturtevant Mill Co.

Mills, Colloid.....Operate at speeds approaching the theoretical minimum required for true wet micro grinding —shaft speeds up to 10,000 rpm depending on size and type of mill. Offers descriptive literature.
BR429 *Admiral Tool & Die Co.

Mills, Grinding....Dry, grind, classify—in a single system—materials carrying an appreciable amount of surface moisture, reducing them to dry, finely-ground products. Offers full details in Bulletin 17-B-11.
326a *Hardinge Co.

*See explanation on p. 406

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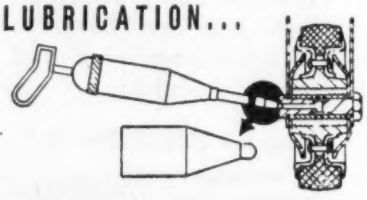
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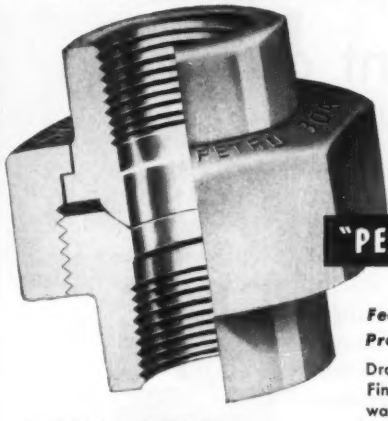
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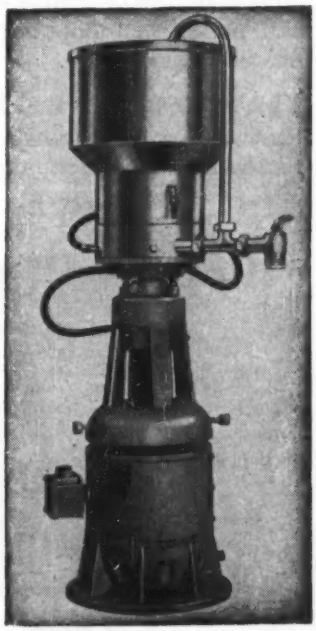
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119a *Mixing Equipment Co.

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430C International Engrg.

Mixers, Portable.....Illustrated, 16 p. covers company line: "H" series; "G" series; "S" series; variable speed; air driven; etc. Includes design service, engineering suggestions & accessories. Bulletin No. 520.
430D Eastern Industries.

Mixers, Side Entering.....Furnishes detailed information on features, typical applications, mechanical design, maintenance, shaft seals, methods of installation, etc. in completely illustrated Catalog B-104.
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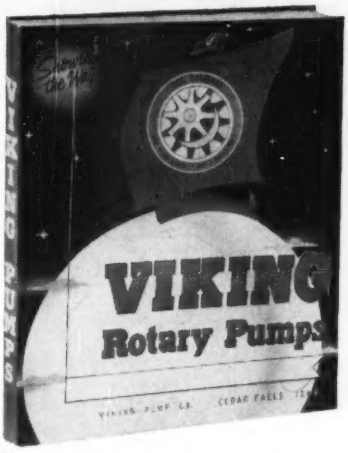
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*See explanation on p. 406

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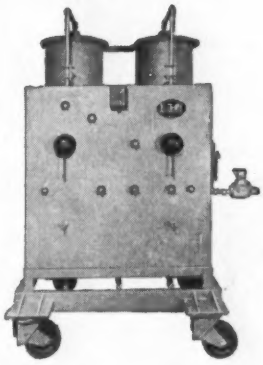




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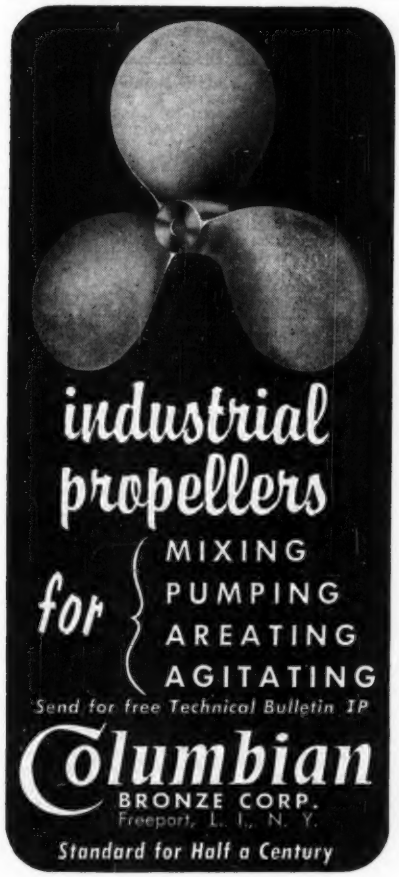
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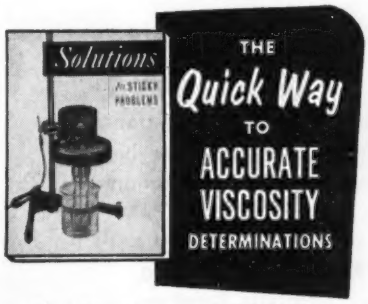
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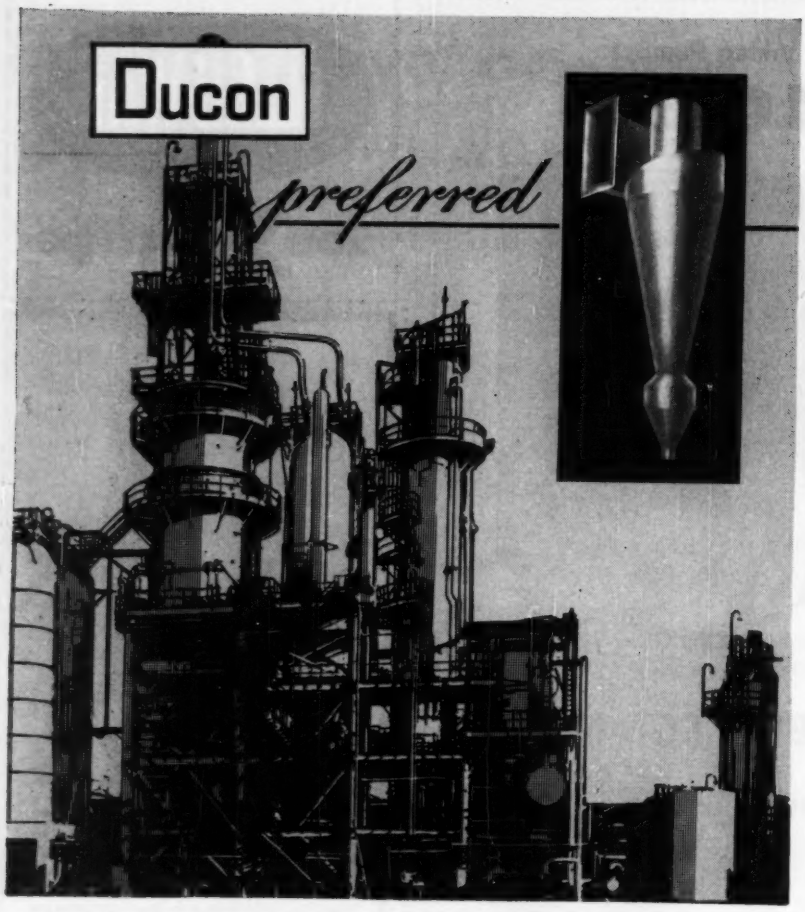


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293 *D. R. Sperry & Co.

Process Equipment.....New reference covers the complete line of Buflovak equipment for processing food products, pharmaceuticals, chemicals and for by-product recovery. Details in illustrated Catalog No. 363.
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TL415 *Denver Equipment Co.

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432E Schutte & Koerting Co.

Wire Cloth.....84 p. Catalog describes company's facilities for fabricating wire cloth parts. Includes wire cloth parts for screening, filtering & special uses. Also helpful metallurgical information.
338 *Cambridge Wire Cloth Co.

Wire Cloth.....Newark metallic filter cloth is available in a variety of weaves in all malleable metals, and is adaptable to practically all types of filters. Offers complete details in company's new Catalog E.
407 *Newark Wire Cloth Co.

Pumps, Blowers, Compressors

Blowers, Centrifugal.....Rugged castings, husky, perfectly balanced rotor & externally mounted, cylindrically seated bearings are design features that reduce maintenance & insure long service. Bulletin No. 0500.
291 *De Laval Steam Turbine Co.

*See explanation on p. 406

Compressors, Carbon Piston.....Quality leader in compressors, pumps & rock drills for construction, mining, petroleum & general industry features the dependable CRX carbon piston compressor. Bulletin CRC-10.
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Compressors, Centrifugal.....Offers a complete line of centrifugals for gas compression and refrigeration—up to 10,000 horsepower in a single unit. Details in "Centrifugal Compressors for Industry."
41 *Carrier Corp.

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TR381 *Sigmamotor, Inc.

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79 *Chempump Corp.

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368 *Worthington Corp.

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224-5 *Duriron Co.

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76 *A. R. Wilfley & Sons.

Pumps, Centrifugal.....Describes new line of centrifugal pumps designed especially for handling corrosive liquids and slurries. Complete information, including performance data, found in Bulletin No. 725.4.
399 *Goulds Pumps.

Pumps, Centrifugal.....Furnishes information on a new line of corrosion-resistant plastic centrifugal pumps. Includes details on special features, capacities, dimensions, applications, etc. Fully illustrated.
433B Protective Plastics.

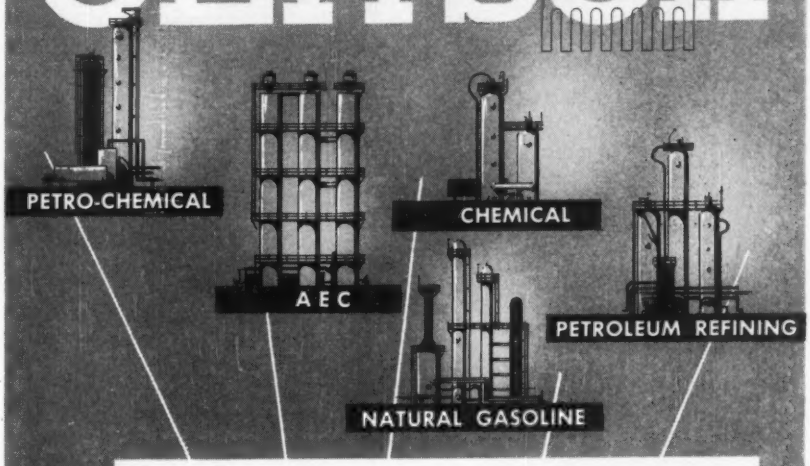
Pumps, Centrifugal.....New, virtually leakproof seal used on Impervite pumps is self-cooled & easily accessible. In addition, entire pump line has been redesigned to increase efficiency. Furnishes catalog.
318b *Falls Industries.

*See explanation on p. 406

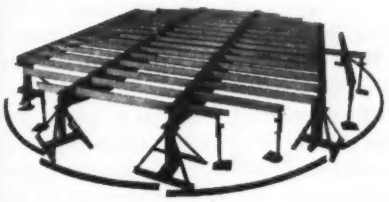
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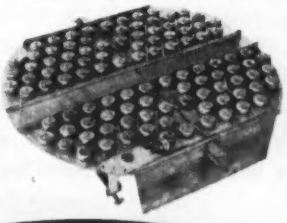


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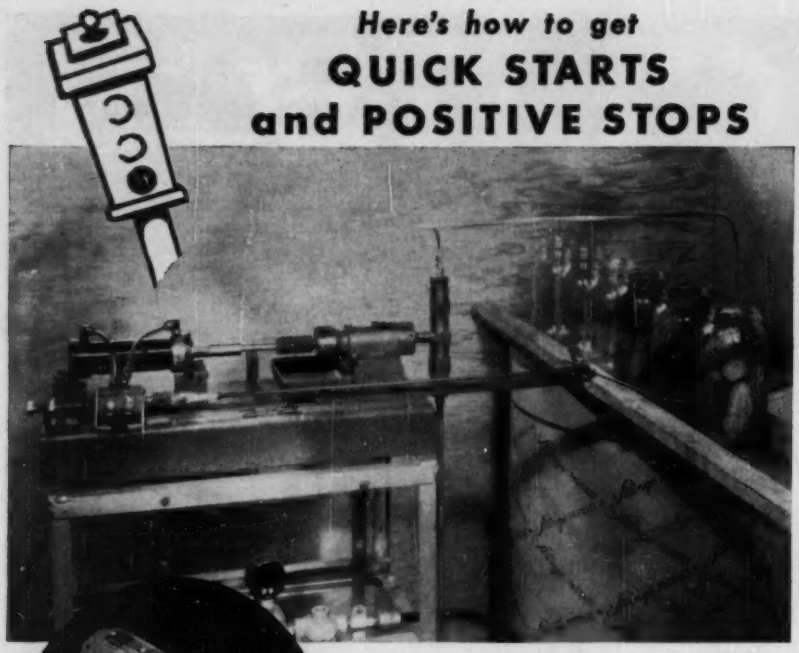
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LITERATURE . . .

Pumps, Centrifugal.....Illustrated, 12 p. describes construction, care and operation, rotary seal, stuffing box, motors, etc. Includes both the single-stage and multi-stage models. Request Bulletin No. 110.
434A Eastern Industries.

Pumps, Centrifugal.....Original manufacturer of self-priming centrifugal pump offers data on new Type CG LaBour—operates under positive or negative suction lift conditions as required. Request Bulletin G-1.
237 *LaBour Co.

Pumps, Chemical.....Built in most used ratings . . . to 3500 gpm, heads up to 550 ft.; handle liquids in most common temperature range . . . up to 550F; in wide choice of materials; etc. Bulletin No. 52B7638.
55 *Allis-Chalmers Mfg. Co.

Pumps, Chemical.....Specifically engineered for handling acids & other corrosive chemicals. Full information including performance charts, selection table, dimensions & specifications in Bulletin 54-1-640.
434B Byron Jackson Co.

Pumps, High Vacuum.....Mechanical booster pumps (Model KMB) are the most advanced design of mechanical high vacuum pumps for modern high vacuum processes. Offers full details in illustrated Catalog No. 400.
434C Kinney Mfg. Div.

Pumps, Piston-Diaphragm.....For controlled-volume pumping of fluids. Flow-charts, typical applications, description & specifications of models of various capacities & constructions, in Bulletin No. 440.
239 *Lapp Insulator Co.

Pumps, Proportioning.....Company announces their new chemical proportioning pump (Model 1105-KH) . . . more pump for less money. Furnishes valuable data covering prices, capacities, and specifications.
103 *Proportioneers, Inc.

Pumps, Slurry.....Slurry pumps handle extremely thick slurries with high specific gravities. Provide long operating life with little or no maintenance. Covers features and selection data in Bulletin 181.
402 *Morris Mach. Wks.

Pumps, Vacuum.....In hundreds of major vacuum processing systems... pumps create low absolute pressures fast and efficiently, and provide quick recovery speed for high production rates. Data in Bulletin V54.
125 *Kinney Mfg. Div.

Pumps, Vertical.....Company's line of vertical pumps are specially built for handling chemical solutions, efficiently and economically . . . in the processing industries. Provides details in Bulletin No. V-837.
L343 *Taber Pump Co.

Services, Processes, Misc.

Ammonia Synthesis.....Advantages of Texaco partial oxidation process, Foster Wheeler improved liquid nitrogen wash system, & Casale ammonia synthesis process . . . in combination. 16 p. Bulletin No. 0-54-1.
123 *Foster-Wheeler Corp.

Apparel, Industrial.....Describes 2 new styles of MSA decontamination safety suits—MSA chemical type (of flexible butyl-fairprene material) and MSA acid type (of neoprene-fairprene fabric)—in Bulletin 1301-2.
434D Mine Safety Appliances Co.

Apparel, Industrial.....New, fully illustrated 1955 Worklon catalog covers acid- & caustic-resistant work clothes (Orlon & Dynel) . . . engineered for the ultimate in comfort—quality—durability. 12 p.
434E Worklon, Inc.

*See explanation on p. 406

Filter Aids.....Chemically inert, sterilized in processing & suitable for filtering all types of liquids from acids to zein. Used in processing many products. Technical Bulletins cover Dicalite filtration.
273 *Dicalite Div.

Filters, Millipore.....46 p. fully illustrated Bulletin includes sections on: the nature & properties; directions for use in microbiological procedures; selected microbiological applications reported; etc.
435A Millipore Filter Corp.

Filter Media.....Performance data on porous "Teflon" filter media, information on complete filter units using this newly-developed fluoro-carbon material, are contained in a new reference, Bulletin T-115.
435B Porous Plastic Filter Co.

Fire Protection, Foam.....An illustrated booklet, "Foam Fire Protection," covers data on advantages of foam. Tested on petroleum or polar-solvents fires. Checked as to extinguishment time, foam volume, sealability.
68 *National Foam System.

Fire Protection Systems.....Automatic fog system protects you around the clock, sounding alarms & putting water to work instantly wherever & whenever needed. "Fire Can Destroy Your Business" upon request.
296 * Blaw-Knox Co.

Flotation Units.....Furnishes informative literature on the Aeroflotor—a new flotation unit. Discusses the principles behind the design of the unit, its operation and its special features. Bulletin WC-119.
435C Graver Water Conditioning.

Laboratory Equipment.....New edition of manual, "Laboratory Glass Blowing with Pyrex Brand Glasses," offers information on working characteristics of Pyrex brand & Vycor brand glasses. Illustrated, 20 p.
435D Corning Glass Wks.

Pipe Lines for Petroleum Transportation.....Describes in general terms, a typical pipe line system, the variables to be measured, and some of the problems of pipe line control. Request 18 p. Bulletin PL-1.
435E Minneapolis-Honeywell.

Plants, Chemical.....Expands plant with a minimum of interference to operations—features outstanding record of maintaining operating efficiency during construction period. Request new chemical Brochure 101.
60 *Kaiser Engrs.

Plants, Packaged.....Packaged plants save time, money. "Pfaudler Services for Unit or Complete Process Operation" tells exactly what you get, and what company must know in order to tackle your problem.
448e *Pfaudler Co.

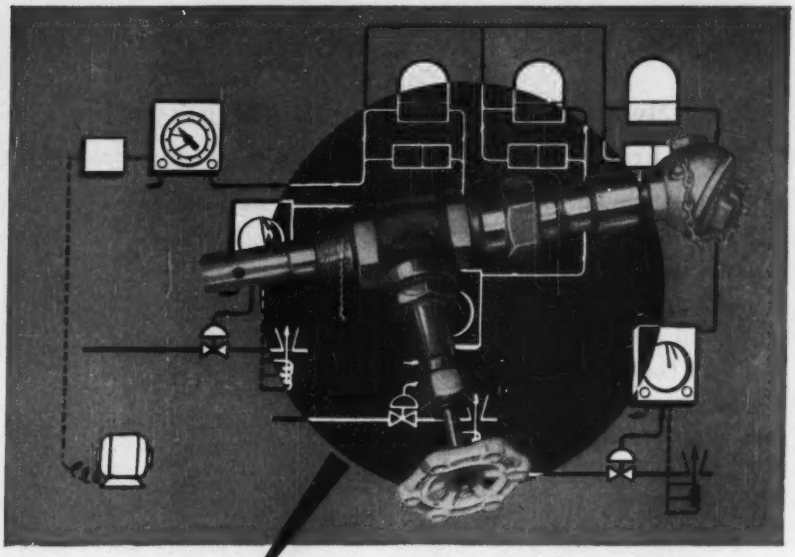
Plants, Pilot.....Company announces the availability upon request of a Bulletin describing typical continuous test plant layout . . . with additional information on Denver continuous pilot plant equipment.
435-F Denver Equipment Co.

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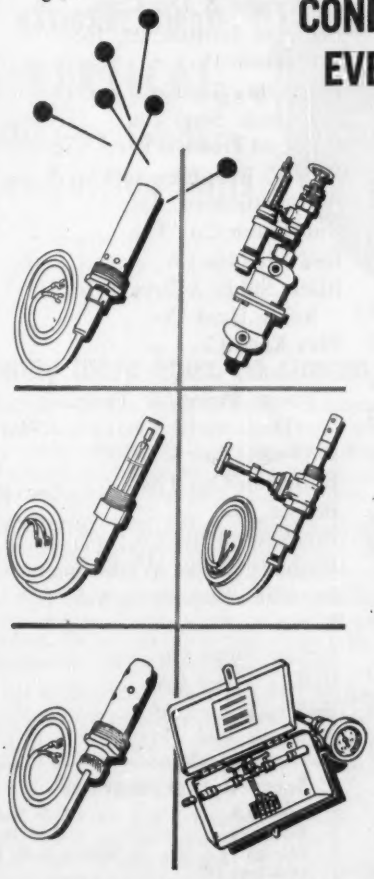
Safety Heads.....May be used as either primary or secondary relief devices, and either upstream or downstream from a relief valve, as varying conditions may require. Presents complete BS&B Safety Head Catalog.
327 *Black, Sivalls & Bryson.

*See explanation on p. 406



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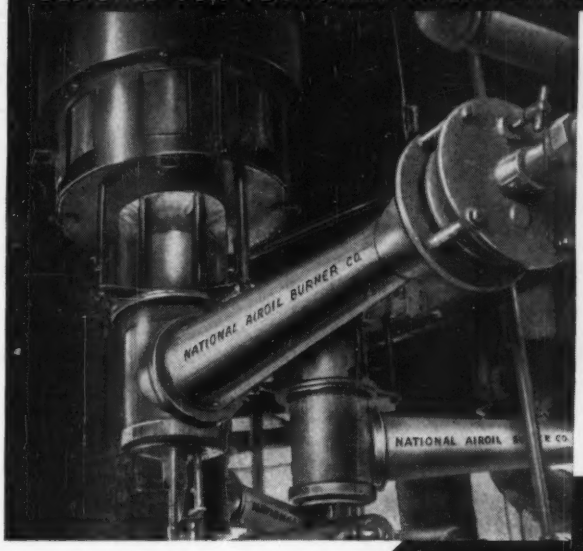
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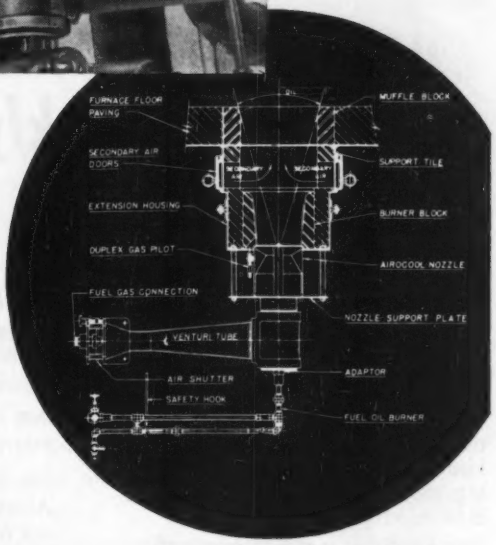
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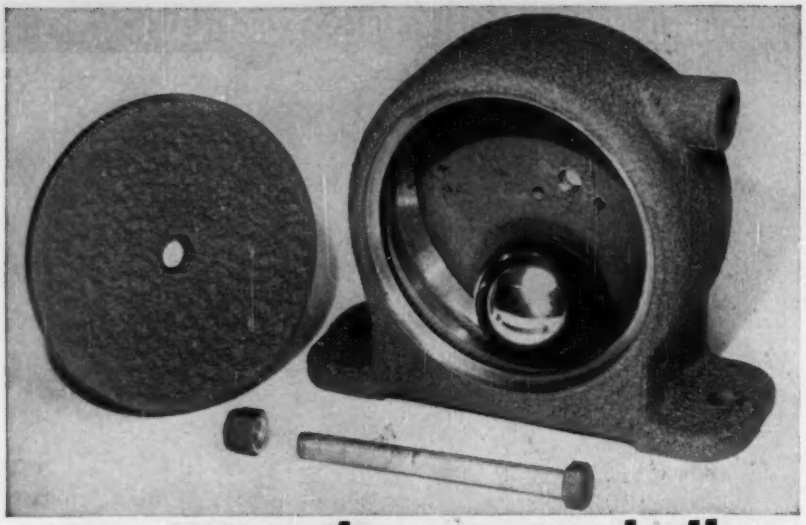
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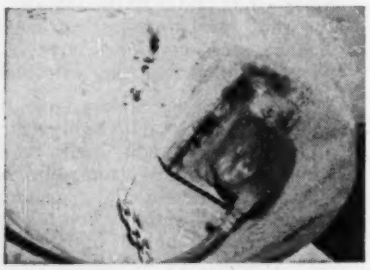
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AiroViber rotary vibration breaks up arching and jamming in bins, hoppers, chutes, feeders, and other places where bulk materials hang up. It is also recommended for vibrating tables or platforms, sorting and many other applications.

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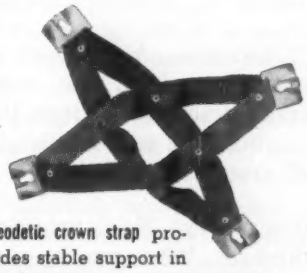


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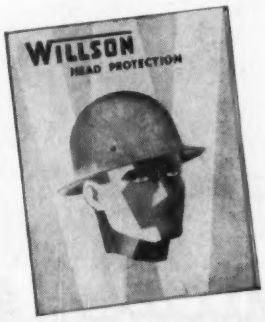
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Aw-w-w, Clarence! You say the swee-ee-est things

Yep! We've been asking reader opinions again. This time, we quizzed a thousand subscribers about CE's *Annual Inventory Issue.*

Most of 'em liked it, many made valuable suggestions for improving the next edition. We got a few brickbats, a whole fistful of bouquets. But Clarence topped them all. My! How that man did carry on . . .

"Liked *everything* about your Inventory Issue," he wrote. "The brand-new idea, the completeness of content, the convenient arrangement of sections, the way you made it easy to get more data . . . material was wholly practical, ads informative. Wonderful job all around!"

Okay, okay! We're not trying to bust an arm patting ourselves on the back. We know the purpose of these surveys is to get editorial guidance from our readers. But can we help it if one goes a little bit overboard. After all, if you were an editor, wouldn't you just love a guy like this?

Ah, that Clarence!

ANNUAL INVENTORY ISSUE

Chemical Engineering

A McGRAW-HILL PUBLICATION, 330 WEST 42ND STREET, NEW YORK 36, N. Y.

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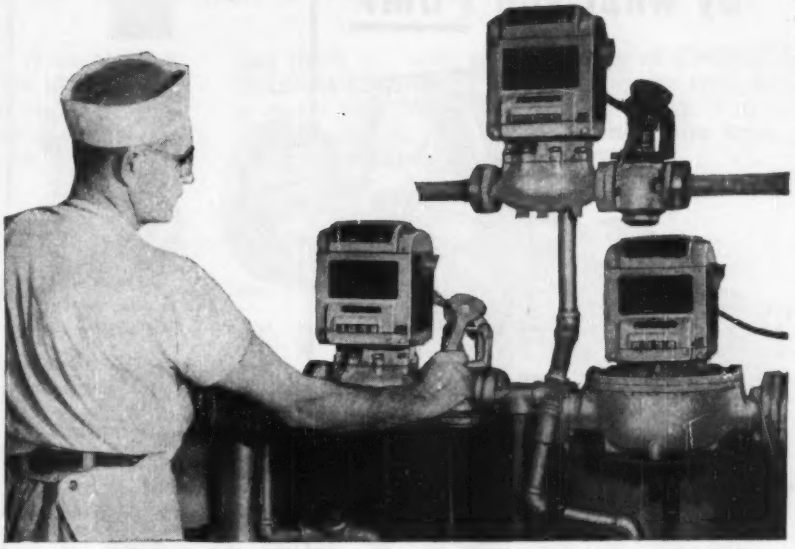
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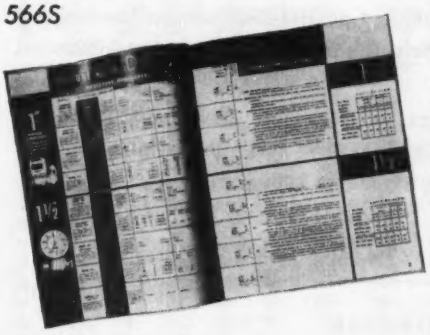
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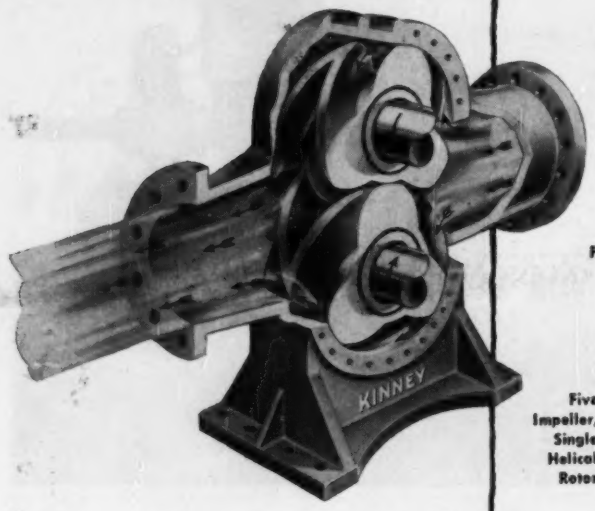
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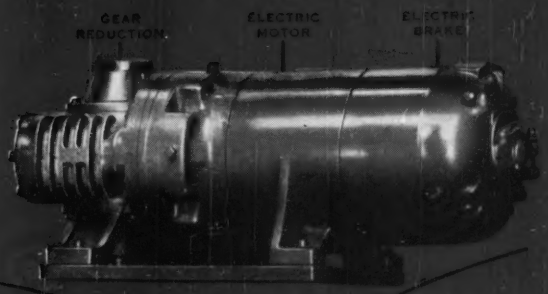
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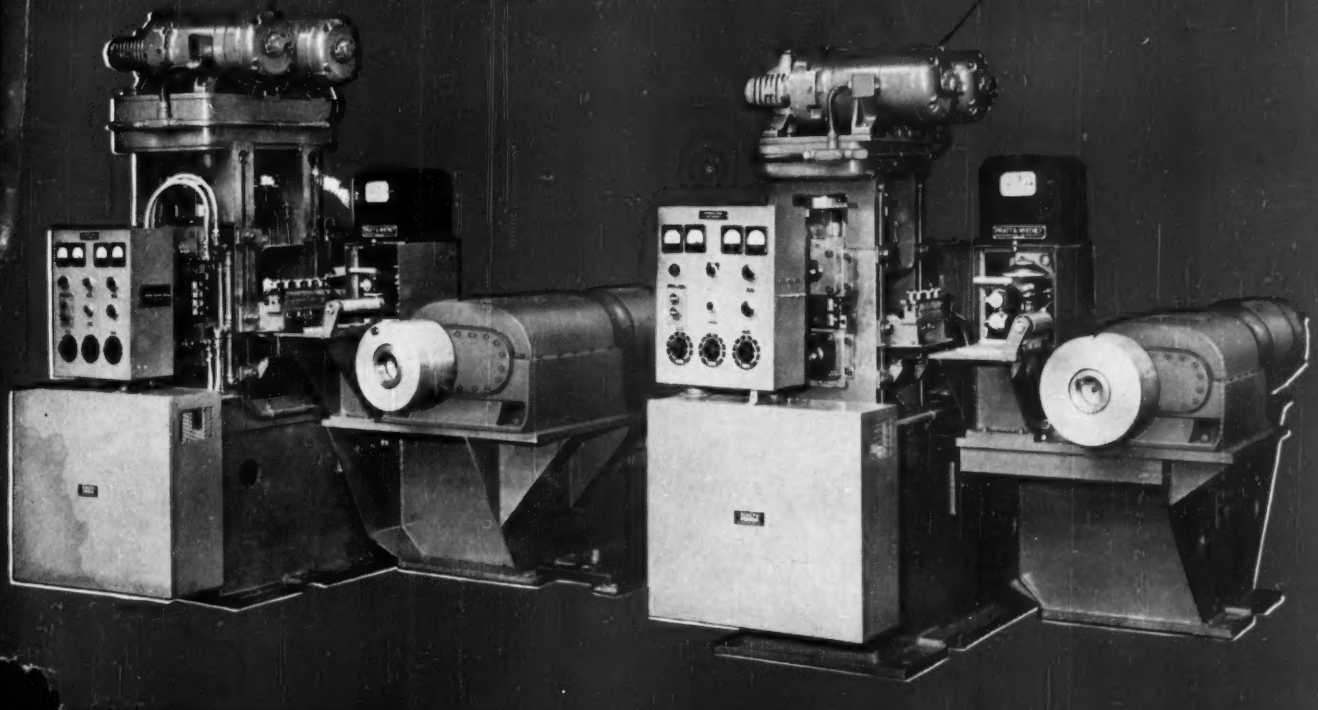


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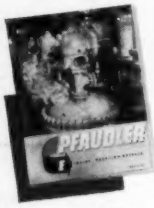


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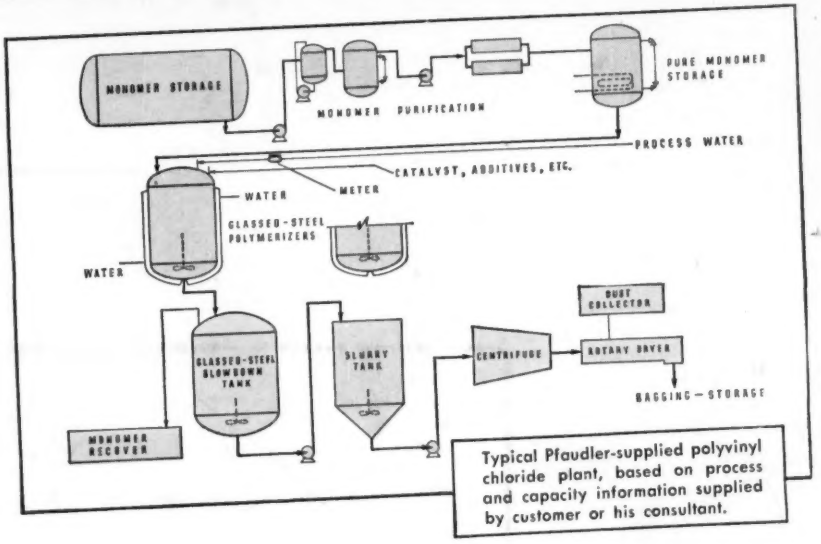


Bulletin 916 "Pfaudler Utilitanks" . . . 4 pp.

What's a Utilitank? How come it costs so little? Why glassed steel?

These and other questions are answered for you in Bulletin 916, giving full data on Utilitanks — the amazing industrial storage tanks that won't rust because they're glassed inside *and* out.

*trademark.



Typical Pfaudler-supplied polyvinyl chloride plant, based on process and capacity information supplied by customer or his consultant.

"Packaged Plants" Save Time, Money

You face hundreds of decisions, when you set up a new process. Many of these, like selection of materials and operating components, can tie up your own busy engineering staff for long, valuable hours.

To relieve you of this burden, Pfaudler offers the services of a large, fully staffed process engineering group. Its members work separately or, if you wish, in a close team operation with your own staff.

They assume *full responsibility* for the 5 steps listed below, delivering your entire plant as a single "package." *And* they follow through—supervising start-up, training your operators and maintaining the equipment, if desired.

1. Process Engineering. You get the advantage of the experience and educational background of an engineering group that has scored successes in a broad range of problems —and can apply this experience to your process.

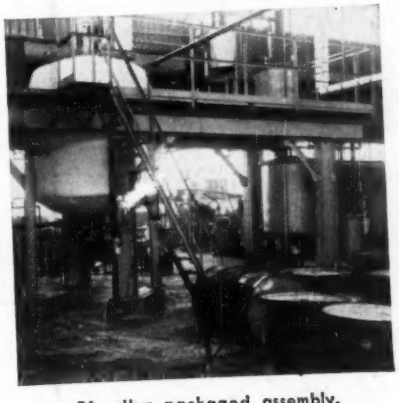
2. Selection of Materials. You get impartial selection of construction materials, because these engineers are entirely free to use glassed steel, stainless steel and all the practical alloys.

3. Corrosioneering. Specializing in the study of new ways to combat corrosion, The Pfaudler Co. gives you the advantages of 71 years of building corrosion-resistant equipment.

4. Equipment Design. You get the money-saving advantages of such standard equipment as Pfaudler reaction kettles, heat exchangers, columns, tanks and other components.

5. Fabrication and Delivery. You can depend on a sensible schedule of deliveries, since everything, including auxiliary equipment, is coordinated by Pfaudler.

A short pamphlet, "Pfaudler Services for Unit or Complete Process Operation," tells exactly what you get, and what we must know to tackle your problem. It may save you thousands of dollars. Write for it today.



Pfaudler packaged assembly, using monel and glassed steel, for making plastic intermediates.

Pfaudler

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